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CONTENTS

EDITORIAL:
Editorial Notes 497
Shop Efficiency and the Scheduling of Work 498
Summer and Winter Passenger Schedules 498
American Locomotive Car 499
LETTERS TO THE EDITOR 500

ILLUSTRATED:
Railway Master Painters' Association 503
Fuel Economy on the Lackawanna; by M. C. M. Hatch 508
Motor Truck Service in Competition with a Railway 510
A Standard Brake Club 512
The Simmen Cab Signal 516

MISCELLANEOUS:
Automatic Train Stops 506
The Railways and the Public; by William Sproule 509
Train Accidents in August 512
Locomotive Fuel Consumption and the Speed Diagram; by A. K. Shurtleff 513
Electrical Equipment of Railway Shops 515
Handling Car Interchange Records on the Chicago & North Western 518
Canadian Pacific Rates 518
Foreign Railway Notes 502, 506

MAINTENANCE OF WAY SECTION.

EDITORIAL:
Editorial Notes 519
Frog and Switch Shops 520

ILLUSTRATED:
New or Improved Maintenance Tools 521
Razing and Erecting Through Truss Bridges with an American Ditcher; by R. P. Black 532
The Roadmasters' Annual Convention 533
An Interesting Method of Renewing Three Turntables with the Minimum Delay to Traffic 542
Modern Crossing Design; by F. W. Rizer 544
Replacing a Wooden Bridge Floor with Steel Under Traffic; by H. S. Cowell 546
Grading and Tracklaying with an American Ditcher 546
Driving Piles; by L. C. Lawton 547

MISCELLANEOUS:
Consolidation of Maintenance Forces; by G. H. Bremner 525
A Student Gang; by Arthur Jung 526
The Mexican as a Track Laborer 527
Creosoted Wood Blocks for Purposes Other Than Street Pavement; by E. A. Sterling 530
Extra Gang Organization; by M. Henry 531
Timely Suggestions; by A. Schwartz 541
Abstract of Engineering Articles Since August 16 543
American Railway Bridge and Building Association Convention 543
GENERAL NEWS SECTION 548

ALTHOUGH the attendance at the Master Car and Locomotive Painters' convention at Denver, Colo., last week was as large as at previous conventions, and each session was as well attended, there was a lack of diversified discussion of the papers and reports. This was largely due to the fact that no advance copies of the papers are sent out. This is an important feature, especially in an association of this kind, where the members are not given to extemporaneous speaking. The result was a tendency for someone to pick out a single point in the paper and the discussion would hinge on that point. Advance copies of the paper should be sent out to the members well in advance of the time of meeting. Taken as a whole, the papers were not as complete as those of last year, although several of them were timely, including those referring to the steel passenger car equipment. A sufficient number of cars of this type have now been in service for a long enough time to give a fair indication as to how they will have to be painted and cleaned to give the best service results. The report of the test committee was one of the best ever presented to the association. The members of the committee have devoted considerable time to the work, and have developed valuable information from tests on practical work. As O. P. Wilkins, chairman of the test committee, said in his report, it would be a very good idea for the association to establish a testing bureau through which various tests may be made in different parts of the country. We regret that we are unable to publish the report of this committee at this time, but hope to be able to do so in the near future

NO one familiar with conditions will deny that the present organization of the maintenance of way department with its highly departmentalized subdivision is unwieldy and inefficient, because of the very nature of this organization. How to best remedy this condition is a problem. Mr. Bremner's method, suggested in his paper on the "Consolidation of Maintenance Forces," and published in the Maintenance of Way Section in this issue, meets this situation squarely by combining all these different minor branches into one, and in this way eliminating much of the lost time in the present organization. This may appear at first glance to be a radical departure, but an investigation will show that it is not as radical as it seems. On many roads the division engineer handles all maintenance work, and the division heads of these different departments report to him. This suggested organization would simply extend this unified force down one step further to the foreman. Many men will say that this cannot be done with the foremen we now have. The success of the Union Pacific's trial of combining the maintenance of signals, commonly regarded as the most complicated of regular maintenance work, with track work is an answer to this. Also with a combined force it will be possible to pay better wages for foremen without materially decreasing the savings effected, and the standards of foremen will be raised. With the average man too much cannot be expected at first, but, if carefully instructed, he is capable of handling all ordinary light maintenance work. If a foreman can maintain track and automatic signals, as is done on the Union Pacific, he should be able to surface and line a pile trestle, repair a stock yards fence or a depot platform, or fix a pump. In combining organizations, the best foreman from each department should be retained as such, and placed where his special experience will best fit him for the work to be done. The strongest objection will come from those roadmasters, superintendents of bridges and buildings, etc., who see the gradual elimination of these positions. This need not necessarily result, for they will still be required to supervise the more difficult and complicated work requiring larger forces. Objections from this source also reveal some of the defects of the present organization where the interests of the department are frequently placed ahead of those of the railway. This plan deserves the serious consideration of maintenance and operating men, and it is to be hoped that it will be given a fair trial on some prominent road in the near future.

SHOP EFFICIENCY AND THE SCHEDULING OF WORK.

SHOP schedules, or schemes for routing work in locomotive repair shops, are not new. Where they have been given a fair trial they have practically revolutionized shop practice and yet for some reason they are used to a much less extent than would be expected by anyone at all familiar with the advantages which result from their use. The first schedules which were developed were very simple in form and application and while they were difficult to install, as would naturally be expected when the radical changes in shop operation necessitated by their use is considered, soon demonstrated that they were well worth the trouble caused in getting them started and keeping them going.

Probably the Chicago & North Western shop at Chicago was the first large plant to introduce such a schedule. Roughly, the first steps taken were to divide the repairs made to the locomotive into three classes, one requiring 24 days, another 21 days and the third 8 days. The work was then carefully scheduled so that the foreman of any one department knew exactly the date upon which his part of the work must be ready for each engine in the shop. He could thus plan ahead and handle it in the proper sequence and to the best advantage. What was the result? Within a comparatively short time after the schedules were put into effect the output of the 21 pits was increased from 30 to 40 locomotives per month, some of the improvement being due to improved shop equipment, but most of it to the use of the schedule. Moreover, as the new system gradually showed the weak spots in the organization and operation of the shop, and they were corrected, it was found possible to materially reduce the number of days required for the different classes of repairs. An important feature, which went hand in hand with the introduction of the schedule, was the provision for receiving an exact report of the condition of each engine well in advance of its being sent to the shop for repairs. In this way the material which might be required could be ordered and prepared beforehand.

A recent application of such a schedule to a large shop, and somewhat more elaborate than the earlier schedules, was described by Henry Gardner in a paper on "A Practical Application of the Routing System to Locomotive Repairs," presented before the Central Railway Club last week. The system which he described was introduced under his direction in the West Albany shops of the New York Central & Hudson River. While in principle it is quite similar to the Chicago & North Western schedule, it is somewhat more elaborate and is especially designed to suit the conditions at West Albany. However, it has not been complicated to any great extent and has been successfully used for an output of 90 engines a month. The only force required is a competent man, called a schedule clerk or foreman, and an assistant for clerical work and checking. The more important changes from the simple form of schedule are the addition of a "tickler" or daily reminder of the material and operations due; a material delay sheet; a despatch board from which the clerk or foreman can see almost at a glance where each piece of material is, when it went there and when it is due for delivery to the erecting shop; a simple slide rule for convenience in assigning dates; and blackboards at various points in the shop so that the workmen in the different departments can see just what jobs are ahead and the order in which they must be finished.

Briefly some of the more important results which have become apparent thus far are: The developing of the different departments so that the work is better balanced and the departments are of equal strength considering their output; the men are not suddenly called on to work at night; there is a better feeling between departments because there is no question as to just when each one must have its work finished; the piece workers favor the system because they get the work on time and in proper sequence; the foremen are relieved of making unnecessary explanations, or of being unjustly blamed; the foremen's meetings are now devoted to discussing matters for bettering conditions and not in tiresome and unnecessary discussions as to output and condition of material, the responsibilities for delays, etc.; the foreman is relieved of endless running about and can devote more time to improving methods and executive work. The new system has practically revolutionized conditions at the shop, and on a conservative basis is expected to result in large savings. It must not be forgotten that smaller shops will benefit greatly by the introduction of a simpler system which will not require any, or at least very little extra supervision.

SUMMER AND WINTER PASSENGER SCHEDULES.

THERE has long been discussion of the advisability of the railways in the northern part of the United States making different schedules for their passenger trains in mild and in severe weather. Sometimes the schedules have been more or less lengthened on the approach of winter. Ought it not to become the standard practice to operate under different schedules during these different parts of the year? The speed at which trains should be run obviously depends on the conditions of operation. Now, the conditions on the railways in the northern part of the United States are radically different in winter from what they are in the summer. The amount of freight traffic to be handled in the fall and winter is normally much greater than in the spring and summer, and the faster passenger trains are run the more they interfere with freight transportation. The railways are going to have all the freight traffic that they can handle this fall, even though the interference with it from passenger trains be reduced to the minimum. Both the economy and the facility of freight transportation would be increased by a lengthening of passenger schedules.

It may be thought that this would cause inconvenience to passengers. Probably the opposite would be the case. The time that it is possible for trains to make in winter is less than in summer. The locomotives work less efficiently. Snow, even when it is not necessary to plow it out, interferes with fast running. Station forces cannot handle baggage and mail with the same rapidity under winter conditions. These and many other circumstances conspire to make the movement of passenger trains slower in winter than in summer, even though the printed schedules are not changed. The result, therefore, of keeping in effect the same printed schedules in severe as in mild weather is to have more late trains. Now, a passenger who knows that his train is scheduled to make its run in 15 hours, for example, probably will offer no complaint if it covers the distance in that time, but if the printed schedule is 12 hours, and he makes business or social engagements with the expectation of reaching his destination in that time, he will complain, and justly, if it takes him 15 hours. From the standpoints of both the public and the railway, it is better to publish schedules which it is reasonably practicable to make than to publish schedules which cannot be lived up to.

Finally, and most important, trains cannot be run safely on as fast schedules in winter as in summer. The engineman cannot keep his head outside of the cab in cold weather as he can in warm weather, and as the windows of the cab become frosted, the chances of his failing to see a signal are increased. The track becomes frozen, rails and wheels become more brittle, increasing the chances of serious derailments. These and numerous other conditions make fast running in winter more dangerous than in summer.

The undesirability of trying to maintain the same passenger schedules in winter as in summer was exemplified last winter. Innumerable passenger trains were late, and doubtless the epidemic of rail breakages that occurred was partly due to fast running by engineers who were trying to make up lost time. Next winter may be mild, but nobody now knows whether it will be or not. After severe weather has come it is too late to change schedules, because owing to the severe competition in passenger service, such changes can be made only by conferences and agreements between the competing roads in each territory.

In view of the conditions, it would seem that wisdom dictates that steps should be taken at once toward lengthening out passenger schedules and that once the practice of doing so in the fall has been adopted, it should be continued. The conditions on different railways are, of course, widely different and the speed that can be made on them varies in proportion, but it seems almost axiomatic that the maximum speed which under any particular conditions may safely and properly be made in warm weather must under those same conditions be more or less dangerous in cold weather.

AMERICAN LOCOMOTIVE COMPANY.

THE annual report of the American Locomotive Company for the year ended June 30, 1912, reflects graphically the effects of the depressed condition of the locomotive market during the period as a whole, combined with the serious strike of the boilermakers which reduced the operations of this particular company to a minimum during four months. The gross revenue for the year, including the earnings from the manufacture of automobiles, was $30,449,452, a decrease of $10,199,933 from 1911; and only 0.47 per cent. was earned on the common stock, as compared with 7.26 per cent. in the previous year. It was only the heavy increase in orders since the first of 1912 that kept the company from showing a deficit, for the volume of sales for the last half of 1911 was equivalent to only 33 per cent. of the amount of business necessary to keep all the plants running at full capacity. The outlook for 1913, however, is most encouraging. The amount of unfilled orders on the books on July 1, 1912, was $14,450,000, as compared with $6,015,000 the year before; and contract work in course of construction on June 30, 1912, was $2,051,187, as compared with $740,550 at the end of the previous fiscal year. All the plants were in operation at the close of the year, with the exception of the Cooke Works, Paterson, N. J., and that plant has since been opened.

The manufacturing, maintenance and administrative expenses, including a charge of $1,021,382 for depreciation were $28,117,547, a decrease of $8,408,968 from 1911. The profit available for dividends was $1,867,554, a decrease of $1,698,008 from 1911. The surplus after paying the 7 per cent dividends on the preferred stock was $117,554, a decrease of $1,698,008 from 1911. In 1911 $300,000 was credited to the extraordinary additions and betterment fund, but in 1912 nothing was credited to that account. The net credit to profit and loss was $117,554, a decrease of $1,398,008 from the previous year. During the year $436,736 was spent on additions and betterments, of which $267,350 was charged to capital account and the rest to the extraordinary additions and betterment fund, leaving a balance of $416,023 in that fund.

On October 1, 1912, there will be paid the first installment of $1,000,000 coupon notes which were issued on October 1, 1909, leaving outstanding $4,000,000 coupon notes of that issue, of which $2,000,000 are due October 1, 1913, and $2,000,000, October 1, 1914. During the year $6,000,000 5 per cent. coupon notes, dated July 1, 1912, were authorized. These notes are divided into three series of $200,000 each, maturing at intervals of one year beginning with July 1, 1915. Of this issue there has been sold $1,200,000 of each series, making a total outstanding, as of July 1, 1912, of $3,600,000. The balance of this issue will be sold as the purposes of the company may require.

On June 30, 1912, the convertible assets totaled $23,783,454, while the current liabilities totaled $15,134,059. At the end of the previous fiscal year the convertible assets totaled $17,673,014, and the current liabilities totaled $8,400,864. The proceeds from the sale of the $3,600,000 notes enabled the company to increase its cash on hand. This increase was $1,509,689, while accounts collectible increased $3,064,129, and contract work in course of construction increased $1,310,637 over the previous year in response to the expansion of business. Among the current liabilities notes outstanding increased $2,600,000, loans payable increased $1,500,000, and accounts payable increased $2,651,164 over the previous year.

The report of President W. H. Marshall is in part as follows: "Apart from the loss in profits due to the natural decrease in business, the company suffered serious financial loss as a result of a strike of its boilermakers which affected practically all of its plants and lasted from October, 1911, to February, 1912. During this period production was badly retarded and at times the plants were practically at a standstill.

"Any disagreement with our employees is to be regretted, but an issue was forced upon the company which had to be met without compromise, regardless of the fact that such a disagreement, with its attendant expense and arrest of output, might greatly reduce the net earnings for the year. Our employees individually and collectively express themselves as entirely satisfied with their relations with the company. Solely out of sympathy with the boilermakers of a railway system who were out on a strike, our boilermakers insisted that this company should not perform its contracts with the railway until the railway had adjusted its differences with its own boilermakers. This company could not, as a matter of principle, submit to such a demand, and stood firm in its position until our workmen receded from the attitude they had taken.

"The annual physical inventory of materials and supplies was taken at the close of the year and priced at cost, unless such cost was above the market value on June 30, 1912, in which case the market price was used.

"The balance sheet includes a charge of $1,529,568, representing equipment trust notes discounted by this company in advance of maturity, and as there is a possible obligation in the event of any default in payment, a like amount is also shown as a contingent liability. The notes are secured by a lien upon the locomotives and the security is ample. There has been a decrease in this account since last year of $613,987.

"The bonds of the Dickson Manufacturing Company, amounting to $562,500, heretofore carried as a liability, were retired during the year, and therefore, are not shown on the balance sheet.

"During the year the company discontinued the manufacture of steam shovels and dredges, and made a contract with the Bucyrus Company by which that company purchased all new steam shovels and steam shovel parts and materials which were in stock on January 1, 1912. The Rogers Works, at which plant this class of product was made, will continue to manufacture small locomotives for logging, plantation and contractors' use.

"The Atlantic Equipment Company, the entire capital stock of which is owned by this company, has for a number of years negotiated the sale of steam shovels, dredges, industrial locomotives and second-hand railway equipment. The manufacture of steam shovels and dredges having been discontinued, the Atlantic Equipment Company has disposed of its business in second-hand equipment, and all sales of industrial locomotives will be made by the American Locomotive Company."

CONVERTIBLE ASSETS.

	1912.	1911.
Cash	$4,375,540	$2,865,851
Accounts collectible	9,924,566	6,860,437
Bills receivable	777,592	993,343
Accrued interest	13,123	4,744
Material and supplies	5,688,823	5,282,729
Contract work in course of construction	2,051,187	740,550
Steam shovels, industrial locomotives and automobiles manufactured for stock	952,621	925,360
Total	$23,783,454	$17,673,014

CURRENT LIABILITIES.

	1912	1911.
Coupon notes	$8,600,000	$6,000,000
Loans payable	1,500,000	.....
Accounts payable	4,503,233	1,852,069
Accrued interest	92,876	110,271
Unclaimed interest	450	1,025
Dividends on preferred stock payable July 21, 1912	437,500	437,500
Total	$15,134,059	$8,400,864

Letters to the Editor.

IMPROVEMENT IN CHILLED IRON WHEELS.

CHICAGO, September 6, 1912.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

In my article in your paper of June 12, entitled "The Chilled Iron Car Wheel," the statement was made that "statistics show that with the rapid increase in carload capacity, there has been a decrease in wheel failures."

This statement is strikingly substantiated in an article published in your issue of July 19, 1912, entitled, "Effect of Wheel Coning on Sharp Flanges," showing a remarkable decrease in broken flanges on the lines of the Pennsylvania Railroad from 1904 to 1911. The flange failures on this road at the present time are only one-fourth as many as in 1905, notwithstanding the fact that the number of 50-ton cars has more than doubled and the total number of all kinds of cars has increased 25 per cent., and 90 per cent. of the 50-ton cars are equipped with the standard chilled iron wheel.

The gratifying reduction in the number of broken flanges is attributed in this article to the change made by the Master Car Builders' Association in increasing the cone of the wheel from 1 in 38 to 1 in 20. While this change has had a beneficial effect, other changes have been made which, it is believed, have had much more to do with the strengthening of the flange than the slight change in taper. Reference to the illustration will show all the changes made during this period for the purpose of increasing the strength of the flange in the M. C. B. wheels for 50-ton cars.

The increase in taper unquestionably has a tendency to keep the flange away from the rail, reducing friction and flange wear. Early experiments with "no cone" showed a very rapid flange wear as compared with wheels having a reasonable cone. Experiments on a large scale with a 1 in 15 cone resulted in a very high mileage and corresponding freedom from flange failures. The present M. C. B. cone of 1 in 20, although twice as much as was standard prior to 1904, in reality amounts to a very small difference in the short distance between the throat of the wheel and the bearing point on the rail. Furthermore, the cone is constantly changing as the tread becomes worn in use, resulting in a gradual change from the original cone to a worn hollow condition. Therefore, the original cone does not have a lasting effect on flange strength. It does, however, assist in starting the wheel to maintain a proper relation to the rail, producing a uniform wearing of metal in each wheel.

It will be noted that there were two increases in the thickness of the tread and flange during the period under consideration. The first, in 1904, shows the metal added as the weight of the wheel increased from 630 lbs. to 700 lbs.; during 1906 a further increase in thickness was made, starting at a point slightly below the base line and extending all the way around the flange and back of the tread, producing a material increase in tread thickness, and making the weight of the wheel 715 lbs. The results on all railways indicate a marked reduction in flange failures since this standard has become operative.

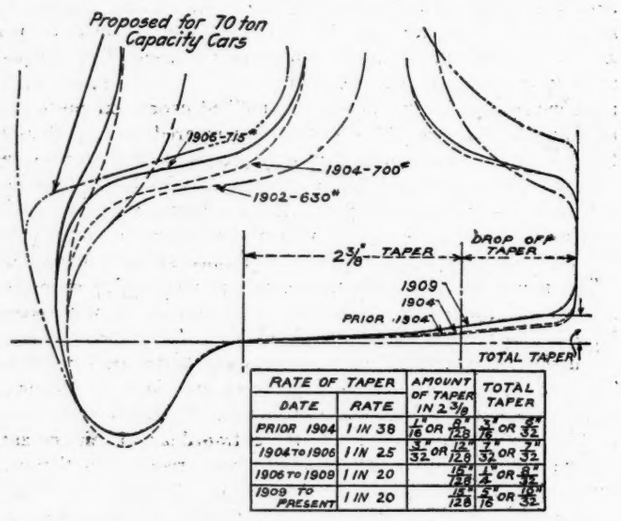
During 1904 and 1905 large numbers of wheels under cars of 50-ton capacity weighed but 630 lbs., and carefully tabulated results show that the flange was not nearly as satisfactory as the flange of the 700-lb. wheel, and since the 715- and 725-lb. wheels have become standard a further reduction in flange failures is being experienced everywhere.

It must be remembered that prior to 1904 there was no concerted action toward producing a standard M. C. B. wheel; but during that year a committee of manufacturers of chilled iron car wheels was called upon to meet with the wheel committee of the Master Car Builders' Association for the purpose of agreeing upon wheel standards for the 30, 40 and 50-ton cars. In 1908 the Association of Manufacturers of Chilled Car Wheels was organized for the purpose of considering improvements in the chilled iron wheel, and in 1909 made its recommendations to the Master Car Builders' Association for the flange and tread section which is standard today. The benefits derived from the harmonious working of the two associations mentioned above are well shown in the increased reliability of the flange, as indicated by the records of the Pennsylvania Railroad, and other lines.

Other parts of the chilled iron wheel have been improved in the same or greater proportion, because of more freedom allowed in design in the body of the wheel. It must not be assumed, however, that the limit of improvement has been reached during the four years of active co-operation with the Master Car Builders' Association.

The function of the flange is to guide the trucks with safety, and to fulfill this mission satisfactorily there must be no flange failure, even when worn to the condemning limit. The space allowed the flange in track work is 1¾ in., which is the only dimension in track or car construction that has remained constant throughout the development of railway equipment from the 10-ton car to the 70-ton car. Millions of dollars have been spent in increasing the dimensions of rails, car bodies, trucks, axles, wheels, etc., but no increase has ever been allowed in the space occupied by the flange. Not only is this space restricted to 1¾ in., but all allowances for variations in casting the flange, in mounting wheels, and irregularities in track work are deducted from the flange thickness. In other words, the flange must be made so thin that it will not interfere with a combination of bad foundry work causing a thick flange, mounting the wheels to extremes of the gage, and narrow flangeways in the track. This indicates that the relation of flange to track and the relation of rapid increase in the load carried on the wheels has not been carefully worked out with reference to maintaining the highest factor of safety in the flange, notwithstanding the fact that ¼ in. more allowance could be made in guard rail openings without expense to the railways. The fact that the flange has rendered such satisfactory service stands in the way of obtaining greater perfection, but now that cars exceeding 50 tons in capacity are being built, there must be serious consideration in order to produce a factor of safety in the flange commensurate with the important service which it performs.

A flange of more satisfactory dimensions is entirely consistent with present track clearances, if proper consideration is given to the mounting of the wheels. If ¼ in. more clearance were allowed in guard rails, even with no change in the width of the flangeways of frogs and crossings, a flange could be designed



RATE OF TAPER		AMOUNT OF TAPER IN 2 3/8	TOTAL TAPER
DATE	RATE		
PRIOR 1904	1 IN 38	1/16 OR 8/128	3/32 OR 24/32
1904 TO 1906	1 IN 25	3/32 OR 12/128	7/32 OR 28/32
1906 TO 1909	1 IN 20	15/128	1/4 OR 32/32
1909 TO PRESENT	1 IN 20	15/128	5/32 OR 40/32

Changes Made in Flange and Tread Sections of Car Wheels Since 1904.

of chilled iron that would be entirely safe for cars of 100 tons capacity, and failures under cars of 50-ton capacity would be practically unknown. This change in track work could very quickly be brought about and is entirely consistent with absolute protection to frog points. The fact is that many guard rails at the present time give all the clearance that is necessary and only a comparatively few require changing to establish a standard flangeway of 2 in.

The Association of Manufacturers of Chilled Car Wheels is working on the relation of flange to track, and undoubtedly improvements will continue to be made in the near future commensurate with the important service which the standard chilled iron wheel is performing.

ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS,
By GEO. W. LYNDON,
Special Secretary.

IS THE DISTANT SIGNAL NOT A CAUTION SIGNAL?

I.

HOHOKUS, September 11, 1912.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

In an article on new signal rules in your issue of August 16 it is said:

"Under the new rules a distant signal is not a caution signal. The distant signal means 'proceed prepared to stop at the next signal'—the point of stopping, but not the point of beginning to stop, being definitely fixed. The caution signal does not fix the point of stopping, but establishes definitely the point of beginning to proceed with caution, under control, and prepared to stop—the place of stop being any place short of the train or condition of the track which has caused the caution signal to be displayed. A distant signal does not protect a train between itself and the home signal. No more does a caution signal signify anything with respect to the signal in advance. A one-arm three-position automatic block signal, with the arm in the 45-deg. position is a distant signal—it does not give permission to enter an occupied block." And this, it is said, is "the correct use of two terms which are often wrongly used interchangeably, perhaps on account of the somewhat general impression that all signals that do not indicate stop or proceed are caution signals."

It will surely be agreed that it is not a good thing to make two signal indications and aspects "grow where one grew before" unless the result is a decided gain in expedition, economy or safety of operation. For, the simplicity of few, as against the complication of many indications—some of them, as is likely to be the case, differing but little in practical effect—certainly helps towards clear understanding and correct action, and ought not to be sacrificed except for very good reasons. If this is admitted, it is fair to test the distinction between distant and caution signals by its real usefulness.

Among the reasons given for the distinction are:

First. Better train movements is secured; a train is less delayed if it "proceed prepared to stop at the next signal" than if it "proceeds with caution, under control, and prepared to stop," after passing a distant signal.

Now this is looking at only one side of the question. If the next signal is clear before the train reaches it, a little time is saved. But if the next signal is cleared a little later, the train may have to make a stop that could have been avoided by slowing up promptly on passing the distant signal; and to stop and get under way again, at least with a heavy train, may cause more loss of time than is gained in the other case. This is especially true when one train has to follow another through several automatic blocks; it is believed to be the best practice for the second train to slow up at the first distant indication and fall back so as to get the succeeding signals clear. It may not be possible to show by statistics, but it is believed to be true that, if enginemen are to take one kind of action in all cases when distant signals are "against them," the train movement *as a whole* will be quite as good when the action taken is that required by a caution signal as when trains merely prepare to stop at the next signal.

In all this nothing has been said about safety. But certainly an engineman ought to take no chance of overrunning a stop signal and without a doubt safety would be increased if enginemen did not continue at speed part way from distant to home signals and then try to stop in little more than the minimum distance. The fine calculation necessary in making station stops, where overrunning can do no harm, is neither necessary nor wise in the case of signals.

Occasionally there is a hand switch between a distant signal and its home. Technically, of course, the target on that switch is "the next signal." But it is an interesting question whether the instructions to "proceed prepared to stop at next signal" do not focus attention on the next interlocking or block signal and draw attention away from the occasional intermediate switch, which is rarely in wrong position. If there is such an effect the practice of proceeding with caution should insure greater safety in this particular.

The second reason for a distinction is that as an automatic or other signal that indicates "stop" when the track is occupied, indicates "prepare to stop at next signal" only when the track is clear, to call the latter a caution indication would make the signal give misleading information. It would not be fair to the engineman to require him to run looking out for a train ahead when in fact the track would always be clear. This point, however, hardly seems to apply to the ordinary distant signal which never indicates "stop."

The fault in this reasoning is that too much weight is given to the *information* supposed to be contained in a signal indication. The command to do something, to handle the train in a certain way, is the important thing; and this, in the case of a caution signal, is to run the train so that it can be stopped within range of vision. Now, however the distant indication may be worded, an engineman certainly ought to be looking out when he is running from a distant signal set against him toward the next signal; if he turns to something in the cab, he runs the risk of having his attention distracted longer than he intends and so failing to stop at a stop signal. It should therefore be no hardship for him to look out for anything that may appear within range of vision, including the next signal; and if at the same time he regulates the speed of his train in the way specified, he need have little concern about the supposed misleading information.

Third. If the distant indication is called a caution indication, enginemen will still know that, in the case of automatic and certain other signals, it means clear track and they will surely act on that knowledge. They will thus form habits that will lead to carelessness where caution signals are displayed for obstructed track.

But if it is true that the best train movement on the whole and the greatest safety are secured by having distant signals observed as caution signals, if the reasonableness of the requirement is made clear, and if enginemen are not blamed for such loss of time as would undoubtedly occur in particular cases (the gains in other cases being real but not so evident), there should be no serious difficulty in enforcing right action.

As pointed out above, the distant indication of the ordinary distant signal does not have the same relation to occupancy of the track ahead as does that of automatic block and some other signals; under the former the track *may* be obstructed. From this point of view the ordinary distant signal looks somewhat like a caution signal after all. If it is not, there may yet be a demand for further distinction between it and signals that indicate "prepare to stop at next signal" only when the track is clear. But whether there be one distinction or two, if the statements which I have made accord with the facts, the conclusion is that the signal system is uselessly complicated with distinctions between two or more indications and aspects that require

nearly the same, and could profitably require exactly the same, action and could be merged into one with advantage. C.

[We doubt whether Mr. "C." ought to be encouraged in his subtle reasoning, for we recall that a discussion in this field a year ago was in many respects abortive; but, while recognizing the value of "horse sense" which overrides technicalities, we will mention the other side of the case briefly. "Simplicity of the few," in this case, it seems to us, doesn't mean much but fewness of numbers. There is a simplicity of logic and definition also. It is inevitable that the act of shutting the throttle in preparation for making a stop at the home signal must be done at different places. It cannot be done uniformly at all signals, or by all trains at a given signal. This being so, can it be said that we improve matters by trying to have it done, contrary to reason, at one place? Asking enginemen to run slowly for a mile when they know that it is necessary only in the last half or quarter of the mile puts a constant strain on the discipline. It is like trying to get flagmen to flag when they know that no train is coming. Enginemen ought, indeed, to slacken speed as soon as they find that they are too near a preceding train for convenience; but they can do that without the help of the signal engineer, and should be taught to do so.

A caution signal means run cautiously over the first foot of the track beyond the signal. We cannot require this to be done by a fast train unless there has been a warning in the rear of that signal. But if a distant indication is to be given, this rear warning is not needed, and is not given. Thus we shall have the anomaly of a train which is moving at a mile a minute just before reaching a signal, being required to come down to perhaps 10 or 15 miles an hour instantly after passing the signal. Enginemen who are thus seeing a constant anomaly lose some of their respect for the signal system. As to intermediate hand-thrown switches, will it ever be possible to devise a consistent signal system with these included, as now? They and their special distant signals ought to be made more unlike the regular semaphores, instead of less so. If we could transplant this discussion to some German university we should like to express some further doubts of the position taken by "C." Can it be that the system of aspects introduced with the three-position automatic block signal has produced a slightly staggering effect on our minds, as well as on our lamps?—Editor.]

II.

Topeka, September 2, 1912.

To the Editor of the Railway Age Gazette:

My study of the subject of signaling has led me to believe that an essential thing about a signal indication is that it should give the engineman some instruction as to the action required. Based on this assumption I am asking you to explain the following extracts from your article.

1. "Among the new definitions is that of the term 'caution signal,' which is defined as 'a signal indicating proceed with caution, continue with caution, or proceed at slow speed prepared to stop.'"

(a) What action is required of an engineman when a signal indicates "proceed with caution"? (b) What action is required of an engineman when a signal indicates "continue with caution"? (c) What action is required of an engineman when a signal indicates "proceed at slow speed prepared to stop"? (d) What action is required of the engineman "prepared to stop"?

2. "The distant signal means 'proceed prepared to stop at the next signal,' the point of stopping but not the point of beginning to stop, being definitely fixed."

(a) Why is not the point of beginning to stop fixed? (b) If it is not fixed at the point where the signal is located, why is it located at this point and why not at some point where the indication can be acted upon at once? (c) What does "proceed prepared to stop at the next signal" mean to the engineman? (d) What action must he take? (e) When must he take this action?

3. "A distant signal does not protect a train between itself and the home signal."

(a) Is there any reason why it should not do this, and if so, what?

4. "No more does a caution signal signify anything with respect to the signal in advance."

(a) Is there any reason why it should not do this, and if so, what?

5. "This is in keeping with what is expected of the trainmen on their runs, for they do not translate a picture into words and then act on it, but omitting the intermediate step, they go instantaneously from the picture to the action it calls for."

(a) Why does this not apply to the distant signal, so called?

A Student.

[We do not feel bound to provide a complete interpretation of the rules in question; and the article printed August 16 can hardly be expected to be clear except to readers who are familiar with recent discussions in the Railway Signal Association, and with railway practice generally; but as we sympathize with "A Student" in his fondness for elementary studies, we will say a few obvious things.

To proceed with caution means to run with speed under control, which is defined as being able to stop within the length of clear track that can be seen ahead. The book does not define "caution." Presumably the enginemen are instructed on this point by some other means.

The term "To continue" is used in connection with a signal (a switch target) which never indicates "stop." The switch target only shows which one of two routes may be used. As to whether or not to stop, to proceed full speed, or to proceed at some lesser speed, the engineman must depend on some signal previously received. (To an engineman approaching a hand-throw switch in the trailing direction the target can hardly be called a legitimate "signal," as he will get into trouble, if at all, before he reaches the target.)

"Proceed at slow speed" means at some low rate of speed defined in the rules or in the time table. This rate is not defined in the book before us. "Prepared to stop" means prepared to shut off steam and apply brakes; prepare to stop at a place named means prepared to take action at the proper time and place to accomplish that object.

Question 2*a*.—Because it is variable. A distant signal is fixed a certain distance in the rear of the home; some trains need the whole of that distance, some much less. (2*b*) Because of the cost and confusion of having different signals for different speeds. 2*c*, *d*, *e*.—Go on, prepared to thus stop. Take no action, at that point, unless the speed is high enough to require shutting off steam or applying brakes or both. Take action when action is required; a function which the engineman is called upon to fulfil every minute of his run.

3. See answer to the letter of "C," above.

4. The caution signal, as contemplated in these rules, affects the road from itself to the next signal. Why should it be made to do more?

5. It does; or at any rate we see no reason why it may not reasonably do so. A runner sees a distant signal; his mind "instantaneously goes to the action called for"; he grasps the throttle lever, or the brake valve, or both; and then he moves the lever, or the valve, or holds either or both motionless, according to what rate of speed he finds it necessary or proper to adopt.—Editor.]

Amur Railway, Siberia.—A Russian minister declared in 1907 that the Amur Railway would be completed in 1913. Only on the western third of it, some 500 miles, has work been done on the roadbed, part having the rails laid. A new city, Alexejevesk, will be built where it crosses the Seja, as administration headquarters of the line, with shops, etc.

Queensland Line Almost Completed.—The railway line from Cordalba, Queensland, to Dallarnil is expected to be completed in October.

RAILWAY MASTER PAINTERS' ASSOCIATION.

Report of the Forty-Third Annual Convention, Held at Denver, Including Abstracts of the Papers and Discussions.

The forty-third annual convention of the Master Car and Locomotive Painters' Association of the United States and Canada, was held in the Albany Hotel, Denver, Colo., September 10-13, as noticed on page 480 of the *Railway Age Gazette* for September 13, 1912. After the opening addresses by J. F. Enright, superintendent of motive power and car department of the Denver & Rio Grande, and President J. T. McCracken, master painter of the Interborough Rapid Transit, New York, the report of the committee on the maintenance of steel cars was presented, which included reports from several master painters.

MAINTENANCE OF STEEL CARS.

J. T. McCracken (I. R. T., New York).—We have 500 steel cars, which have been in service about 8 years, and owing to their having been painted properly at the beginning, we have not found it necessary, as yet, to remove the old paint. Our actual cost of keeping these cars in this condition, based on a 14 months' schedule of shopping, is 18 cents per day.

F. M. Pribble (L. & A., Stamps, Ark.).—It pays to keep any class or style of structure well painted, especially steel cars, which yield so readily to the ravages of rust, and more especially when these cars are exposed to wide atmospheric changes, sometimes being moved from one place to another in the course of a few hours, where climatic conditions, etc., are entirely different. Rust, once given a start, is tenacious and hard to handle and will spread in a surprising manner, eating its way back under a seemingly solid film of paint.

J. Spirk (C. R. I. & P., Davenport, Iowa) –Some of our steel gondolas were loaded with hot cinders, which burned off the paint and left the steel bare. The rust soon played havoc with these spots. I scraped them with a steel wire brush, washed with benzine, put on a good coat of paint, and I venture to say, that by that timely attention, a considerable expense was saved.

F. A. Weis (C. R. R. of N. J., Elizabeth, N. J.).—The approximate cost of sand blasting and painting an 80,000-lb. capacity steel coal car is $11, and the average life of the paint is 5 years. The original thickness of the metal sheets used for the sides of coal cars is ¼ in., and if they are allowed to deteriorate to about ⅛ in., it will be necessary to replace them. The insides of these cars are not painted and deterioration is at about the rate of 5 ozs. per square foot of surface per year, due principally to the action of the weather and sulphurous acids due to decomposition of the lading. The exterior surface, if not painted, and if exposed to the weather, will deteriorate at about 3 ozs. per sq. ft. of surface each year. It is evident that, with these rates of deterioration, if the cars are not painted, the sheet will be reduced to about ⅛ in. in thickness at the end of ten years. If they were painted, it would be about 17 years before it would be necessary to replace the sheet. Thus at a cost of $44 for sandblasting and painting, it is possible to obtain seven years more of service.

VESTIBULE END FINISH.

C. A. Hubbs (S. P., Sacramento, Cal.).—Vestibules finished with either natural mahogany or birch stained to match mahogany are the most cheerful, do not show dust like a darker or painted surface, and if not allowed to be out too long before shopping, require but little work to be put in good condition. We have tried a mahogany ground and strippling with oil color, but this is too much like a painted surface and looks muddy. If the new finish of the vestibule is of birch, no shellac should be applied, as the birch contains an acid or sap which causes the shellac to peal in a short time. Varnish should be used next to the stain. Less panels and moldings would tend to make the work more economical. The vestibule finish on our steel coaches is grain mahogany and varnish.

W. Mullendorf (I. C., Chicago).—The interior of the vestibule of a steel car grained to match the interior of the car will be found equally as hard a task to maintain as that of the wooden car. I find the interior of the vestibule painted and finished practically the same as the exterior of the car is the most appropriate finish for this class of work and the only remedy to overcome all of the ailments that the painter has run up against for years in trying to keep the interior of the vestibule up in the natural state. This has been tried out on some of the leading railways of the country, and has given good results from a practical standpoint.

Conclusion.—After considerable discussion pro and con it was voted as the sense of the association that the natural wood, stained or grained finish, makes an appropriate finish for the interior of wood vestibule ends from the standpoint of appearance.

INTERIOR CAR RENOVATORS.

A. J. Bruning (L. & N., Evansville, Ind.).—If you scrub a car on the interior once every thirty days for 18 to 24 months, you are bound to cut off the varnish on the edges. Your window sills, blinds and sash stops become weather beaten unless you go over them after each application of soap and water with a renovator. This adds life to the varnish, protects the edges, keeps the window sills from getting weather beaten and makes the car look fresh and new. The renovator should be a light body, non-drying oil, and one that wipes dry and leaves a polish to the work. Cars can also be cleaned with renovator without using soap and water, providing they are taken in time, or before the dirt gets ground into the varnish.

H. E. Brill (A. T. & S. F., San Bernardino, Cal.).—At terminal points a renovator is very useful, providing the car is thoroughly wiped dry and the corners cleaned and dusted. If this is not done the car will look worse than it did before. The work should be directly in charge of a competent painter, as careless use of a renovator is not only a detriment to the varnish, but makes a heavy job when the cars are shopped. I have several cars that have a good many coats of varnish, and with the use of a good varnish renovator, they can be kept in good condition for several years without applying more varnish.

F. J. Curtis (C. R. I. & P., Valley Junction, Iowa).—The interior varnish of a car should be cleaned by: first, washing with good soap and water, rinsing off and drying with chamois skin, and second, the renovator should be put on sparingly with white cotton waste and then wiped thoroughly with dry waste.

G. Warlick (C. R. I. & P., Chicago).—On a car with a polished surface a liquid made of equal parts of renovator and vinegar will give good results. It should be kept well stirred and only a little used at a time. It takes the dirt off the polished work, and leaves it in very fine condition, and it does not require much labor.

A. J. Bush (D. & H., Oneonta, N. Y.).—I would suggest that you add a little rotten stone to that liquid.

J. H. Pitard (M. & O., Whistler, Ala.).—In some cases, where the varnish has become dull, the car can be kept in service for some little time with the use of a good renovator. Sometimes we begin to use it before the varnish shows the need of it, and that is a waste of money.

C. E. Copp (B. & M., Concord, N. H.).—The nature of the renovator to be used is of course very important; it should be applied to a clean surface, and should be non-drying, and should not produce a film on glass in a warm room. It should be tested first, and if after standing two or three weeks it shows no disposition to dry, or if the atmosphere evaporates it, it is prob-

ably a safe renovator to use. In that case it should be rubbed as dry as possible. I would not apply a renovator on the interior of a car that will produce a film on a test exposure.

T. J. Hutchinson (G. T., London, Ont.).—No matter what renovator you use, it should be made in the nature of an emulsion, and it should never be used or applied by an inexperienced person.

Mr. Pitard.—A very thin liquid cleaner is far preferable to an emulsion cleaner. The emulsion cleaners, in going around corners and moldings, and inaccessible places, are difficult to wipe out, and very often the cleaning is entrusted to careless operators who neglect to get the cleaner out of the corners, and the result is that flying dust will accumulate, and in the course of time the corners will be in a bad condition.

Mr. Hutchinson.—If we had the renovator at the proper consistency before using it on all cars, that might be all right. But very often we have to clean cars that are not shopped, and adding vinegar to the renovator and making it into an emulsion saves time and future trouble, if it does not happen to be rubbed out in a corner here and there.

Conclusion.—It was voted that the association should go on record as recommending that a competent practical painter be placed in charge of all cleaning of equipment of all kinds at terminal points.

REMOVING PAINT FROM LOCOMOTIVE JACKETS.

After a discussion of this subject it was voted to be the sense of the association that the best and most economical method of removing old paint from locomotive jackets was to immerse them in a lye vat.

CONCRETE CAR FLOORS.

A paper was presented by Leo H. Nemzek, chief chemist for John Lucas & Company, Philadelphia, Pa., on the treatment and finish of passenger car concrete floors. An abstract follows:

Concrete is treated both to preserve it and to improve its appearance. The proper method of treating is often-times neglected in order to obtain the decoration at the lowest possible cost. Finished concrete will contain a certain amount of quicklime which has a saponifying action on fatty oils. It is very porous and the expansion and contraction resulting from frequent absorption of water has a weakening effect. The greater the proportion of cement the less will be the absorption qualities and the older the concrete the less capillarity it will have. This should be borne in mind when applying the filler coat to the concrete.

Waterproofing compounds mixed in with the concrete tend to weaken it and the same may be said concerning the materials added for decoration. The colors that have proved the most successful are natural earth pigments, which are practically inert and therefore have no harmful effects. Water soluble dyes have been used to give brilliancy with no harmful effects, but the former are to be preferred, as they are fast color, while the stains invariably fade. It is advisable when contemplating finishing concrete in a color, to write to the suppliers of the cement to learn of the coloring materials which can be safely used.

The absorption of grease and oil not only tends to disfigure a floor, but has a disintegrating action. Many types and grades of mineral oil when allowed to penetrate into concrete that was not thoroughly dry were found to possess a disintegrating influence, but on old surfaces there is no noticeable indication of this. Linseed oil in a concrete mixture does not make it waterproof or make it impervious to the absorption of oils.

The natural grinding action or wear on the surface of a concrete floor will cause a dust which readily adheres to the surface of untreated floors, in a manner which makes it impossible to remove. By painting, the floor is made sanitary, because it

FIG. 1.

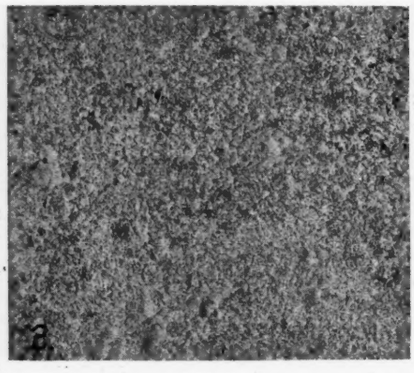


FIG. 2.

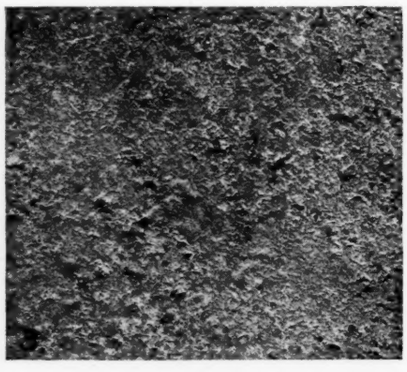


FIG. 3.

FIG 4.

FIG. 5.

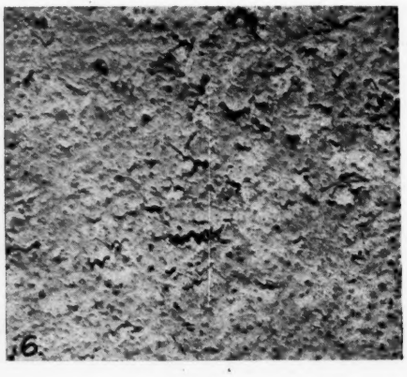


FIG. 6.

Comparison of Concrete Floor Surfaces Which Have Been Treated by Proper and Improper Methods.

may be kept clean and free from all traces of dust and dirt, and oils and grease may be kept from penetrating into the concrete. It is possible to obtain the same color and decoration on concrete floors that is to be had by the painting of wood.

A treatment of the concrete surface which has for its object the elimination of whatever free alkali is present on and near the surface will in practically every instance prove injurious to the concrete. The general results of experiments along this line indicate that it is not advisable to attempt the elimination or change of the alkali to some other form, by chemical reagents.

The most satisfactory results have been obtained by the use of a thin varnish-like mixture which is especially adapted for work of this character. This filler is practically a wash which penetrates into the concrete and destroys whatever action alkali would have on an oil paint coat. In the process of neutralizing any free alkali with which this filler comes into direct contact products are formed, which assist in making a thorough bond within the concrete, without weakening the structure. Capillarity is destroyed by the oxidized film, which results upon drying. The paint coat which follows the filler can then be selected to obtain the desired decoration and will assist in correcting for all the forces that exert deteriorating influences on naked concrete.

Ordinary floor paints which prove satisfactory when used over wooden surfaces give equally as good results when used over a properly applied filler. The wear closely resembles that found on a wooden floor. The paint coat invariably possesses somewhat better bonds within the concrete and the service in many cases is superior to that obtained from the same paint applied on wood.

While it is true in other branches of painting that the application of several thin coats is preferable to thick coats, this method of application is even more necessary for the painting of concrete floors. While good results can be obtained from the application of one coat over a filler, the best service value is given where two coats are used, the first especially being applied thin.

It is not necessary to again apply a filler when repainting floors. One coat of paint applied so that it can be brushed out well will give the best results. In preparing the surface for repainting no strong alkali should be used for cleaning, as it will not only act upon the paint, but if not thoroughly removed will also affect the following coat. It is advisable to go over the surface with warm water and soap, and allow sufficient time to elapse for drying.

The accompanying illustrations show the concrete floors under varying conditions. In each case the actual size is shown. Fig. 1 shows a perfect condition of ordinary floor paint applied over a proper filler. The paint film is in perfect condition. Fig. 2 shows an ordinary floor paint over an untreated surface. The disintegration shown was also found in the case of cement floor paints applied over the same surface.

Fig. 3 shows an ordinary floor paint applied over an improperly applied filler. The excessive scaling is clearly indicated. The same paint was used on the samples shown in Figs. 1 and 2. The same condition was noted in the case of cement floor paints applied over an improperly filled surface.

Fig. 4 illustrates a brittle character of the paint coat. The vehicle portion of this paint was constructed so as to be only slightly subject to the action of the alkali present in the concrete. Fig. 5 shows the appearance of a paint coat after six months' wear over an untreated surface. This is also typical of the results obtained with cement floor paints under similar conditions. Fig. 6 illustrates the disintegration caused by the action of the alkali in the concrete on the vehicle portion of the paint coat.

CARE OF STEEL PASSENGER CAR ROOFS.

T. Spirk (C. R. I. & P., Davenport, Iowa).—When painting steel roofs be sure that they are free from rust and well prepared for the priming coat. That coat must be of solid pigment and pure oil, well brushed on, so that an elastic crust will be formed which will adhere to the steel and become a good foundation for the following coats. The surface must be covered with a solid body of paint, so dampness and cinders will not get to the steel. You will hardly find anything better than red lead, for a foundation coat, at least.

E. L. Younger (M. P., Little Rock, Ark.).—The steel roof should be sand blasted or pickled before painting, to remove all the scale and rust. A passenger car roof receives harder treatment than any part of the car with the exception of the floor, on account of the locomotive cinders, of workmen scarring the paint while making repairs and on dining cars, while ice is being put in the refrigerator. On account of these injuries the roofs should be painted every six months.

W. O. Quest (P. & L. E., McKees Rocks, Pa.).—The principal trouble in keeping paint on a steel roof is caused by the sun. If you paint over any dross or scale the paint becomes dry and absorbent, and the water will get in and rust the roof. The scale should be removed by sand blasting if possible.

J. A. Pitard (M. & O., Whistler, Ala.).—A good way to remove the scale is by pickling the plate in dilute muriatic acid in a vat. The trouble with steel roofs is not so much from scale as it is from the action of cinders wearing away the paint while the car is in service. On our canvas and tin roofs we paint the ends of the cars with a thick paint containing medium coarse sand to offset the effect of the cinders and it gives good results.

MAINTENANCE OF STEEL AND WOODEN PASSENGER CARS.

John Gearhart (Penn. R. R., Altoona, Pa.).—We have up to the present time been getting about 50 per cent. more service from the steel than from the wooden cars; in fact, since the advent of the steel car on our lines about the only people yet called on for repair work are the painters and truck repairmen. As to the relative difference in the cost of maintenance on the exterior of cars, after almost five years service of the steel car it is our impression that this maintenance is greatly in favor of the steel equipment; our experience with wooden cars showed that every time a car was shopped for class or slight repairs it was necessary to replace anywhere from a half-dozen to a dozen panels and the same number of battens due to the panels being split or being scraped by baggage trucks, etc., which, of course, is all eliminated on steel equipment.

On the interior of the steel car we are having more or less trouble with rust due to acids, etc., used when the cars are under construction; we have also experienced considerable cracking of the paint and varnish. This latter trouble will be overcome in time as we are now getting ready to change our practice from air to mechanical drying by installing a baking oven sufficiently large to take care of the largest of our passenger cars.

G. Warlick (C. R. I. & P., Chicago, Ill.).—We have just passed through the first shopping of our steel cars. On our road there are about 200 steel passenger cars and about 1,100 wood passenger cars. The cost for the exterior of the steel passenger cars when they are shopped for class one repairs (which means cutting in and varnishing) is about the same as a wooden car of the same size; the interior of the steel cars is finished in mahogany and oak and receives the same treatment as a wood car and costs about the same for labor and material. There is, however, a saving on the floors of a steel car which do not have to be painted. The cost of painting a car which comes in for class two repairs (which means removing the paint by sand blast or other methods) will be about 10 per cent. more than for a wooden car; there will also be an additional expense of glazing or scraping in; you can figure about $8 to $12 for this operation.

The roofs will require more care, as they will have to be brushed with a steel wire brush to remove rust and keep

them well painted. While there may be, as above stated, more labor on the steel car, it is turned back into service sooner, which evens up the difference in the cost of maintenance.

Mr. Gearhart: The maintenance of the roofs on some of our cars has not cost any more than to coat them over. We are giving them two coats instead of the one we used to give the canvas roof. My experience has been that it is better to have everything on a steel car sand blasted. We made some tests, and in the instances where we did not remove the scale, inside of two years the scale was removing the paint. I would sandblast the cars all over when we repaint them. The cold rolled steel should be sandblasted for we find the paint is coming off the inside sheets. We should have insisted upon the manufacturers sand blasting it before they painted it.

O. P. Wilkins (N. & W., Roanoke, Va.).—One reason for not sand blasting the roof is that it does not receive the same treatment as the rest of the car. My experience has been that where sand blast is used, and you only put on a few coats of paint, the film is very thin compared with the body of the car and it soon wears through and corrodes. I found that a surface not sand blasted was better after three years than one sand blasted. I reasoned that the sand blasted surface is more or less honeycombed; these little pinnacles that project up through the thin paint wear off and expose the iron and corrosion sets in, and it reaches under the paint. By using acid pickle and a vat for the roof sheets, we thought we would get better results than with the sand blast, as our cars are to receive only four coats of paint.

W. O. Quest (P. & L. E., McKees Rocks, Pa.).—A heavy sand should be used in sand blasting, for the light sand will not get all the scale off. It should be about the size of rice.

FREIGHT CAR ROOFS.

Although there was no paper on this subject, it was brought up for discussion, after which it was voted to be the sense of the association that it is considered good practice that all roofs of freight cars should be well protected with paint. Either creosote or paint can be used.

OTHER PAPERS.

Other papers which were presented and discussed included those on Exterior Passenger Car Painting, by F. M. Pribble, L. & A., Stamp, Ark., and E. A. Wittes, Ter. Ry. Asso., St. Louis, Mo.; Qualifications of a Foreman Painter, by Charles E. Copp, B. & M., Concord, N. H.; and Removing Stains from Natural Finish, by J. R. Ayres, U. of M. V., Syracuse, N. Y. The test committee also presented an able report.

OTHER BUSINESS.

The next place of meeting will be selected from the following three places, Ottawa, Can.; Detroit, Mich., and Chattanooga, Tenn.

J. F. Enright, superintendent of motive power and car department of the Denver & Rio Grande, and Warner Bailey, retired master painter of the Boston & Maine were elected honorary members.

The following officers were elected: A. J. Bush, Delaware & Hudson, Oneonta, N. Y., president; O. P. Wilkins, Norfolk & Western, Roanoke, Va., first vice-president; T. J. Hutchinson, Grand Trunk, London, Ont., second vice-president, and A. P. Dane, Boston & Maine, Reading, Mass., secretary and treasurer.

RAILWAY CONSTRUCTION IN MADAGASCAR.—The extension of the railway which is being constructed in Madagascar from Brickaville to Tamatave is expected to be completed early next year. The work entails the building of 11 bridges, of which the longest will be 1,469 ft. long. Another, over the Ivondro river will be 1,272 ft. long, and the remainder will range from 630 ft. to 45 ft. in length.

AUTOMATIC TRAIN STOPS.

Recent disastrous rear collisions of passenger trains have aroused renewed discussion of the availability of automatic mechanical devices as a substitute for, or reinforcement of, the vigilance of the fallible engineman; and as a reply to numerous inquiries on the subject, we summarize below such information as is available concerning the principal automatic train stops now in use, together with notes on some of the more recent experiments.

Boston Elevated.—Mechanical trip automatic stop, in use since about 1899. Used in connection with electro-pneumatic automatic block signals and operated by compressed air. This is the oldest automatic stop installation. All of the stops are either on an elevated structure or in a tunnel. Apparatus described and illustrated in *Signal Dictionary*, page 122.

Canadian Pacific.—Prentice's wireless cab signal and stop, in experimental use on a few sections at Toronto. Apparatus described and illustrated in *Railway Age Gazette*, June 23, 1911, page 1659. Hertzian waves, from an insulated wire lying on the ground between the rails, produce an effect on the engine by means of a coherer, the principle being the same as that of the wireless telegraph.

Chicago, Burlington & Quincy.—Rowell-Potter mechanical trip, tested experimentally near Aurora in 1909. Apparatus described and illustrated in second annual report of Block Signal and Train Control Board, and in *Railway Age Gazette*, January 28, 1910, page 217.

Chicago & Eastern Illinois.—Preparations now being made for an extensive installation of the Miller train control system. Apparatus briefly described in *Railway Age Gazette*, August 30 last, page 396. This has an electro-mechanical trip to cause a stop, and an electrical contact, through the trip, to give a proceed indication.

Detroit River Tunnel.—A mechanical device was used experimentally during the first year of the operation of this tunnel. To stop a train a short section of the third rail conductor, furnishing power for propulsion, was pulled over and away from its normal position, thus with drawing current from the locomotive; and this de-energized an electromagnet; and the magnet armature, dropping, opened a valve, exhausting air so as to apply the brakes. The plan also provided for simply de-energizing instead of removing the third rail section.

Erie.—Harrington's overhead mechanical trip automatic stop. This is in regular use on about seven miles near New York City, where it was installed about four years ago. Apparatus described and illustrated in third annual report of Block Signal and Train Control Board; also in *Railway Age Gazette* of May 5 and May 19, 1911.

Great Western Railway of England.—Electro-mechanical cab signal and automatic stop. This apparatus is of interest to American railway men because it is on this road that we find the longest continued experiments with contacting devices on the ground, exposed, in winter. The apparatus was described in the *Railroad Gazette*, November 15, 1907. In the *Railroad Age Gazette*, August 20, 1909, there is a supplementary drawing, together with a record of the performance of the cab signals. The cab signal has been in experimental use on the Great Western more than five years and for most of this time on a considerable number of engines. The brake setting apparatus has been in use only about 15 months. Seven engines are equipped with this apparatus, the addition to the cab signal apparatus being nothing but an electro-magnetic valve so arranged as to apply the brakes. At the present time the Great Western has 35 locomotives equipped, including the seven which have brake setting apparatus, and there are 199 signaling points. All of these are at distant signals; and on the Fairford branch, where all of the engines are equipped, the visual distant signals have been taken down. In this apparatus the adverse indication is given by the lifting of a vertical engine-member as it passes over a ramp on the ground, and a whistle

is sounded. If the block section is clear, an electric current, flowing through the ramp and the engine member, prevents the sounding of the whistle and the application of the brakes, and gives an all-right signal by sounding a bell. The engine member which engages the ramp is so shaped that in cold weather it can be heated by steam.

As the indicating points are at distant signals, and as there is no overlap, the brake applying apparatus is so arranged that the engineman can reset it at will. This is necessary because, of course, it will often happen that a warning will be given at the distant signal while yet the block section is cleared immediately afterwards, so that the home signal is clear before it is reached.

Hudson & Manhattan.—Mechanical trip stops, operated by pneumatic pressure, as on the Boston Elevated.

Interborough Rapid Transit Company, New York City.—1. Mechanical trip stops, electro pneumatic control; the most important installation in America. The express tracks between Brooklyn Bridge and Ninety-sixth street, about seven miles, carry during the rush hours morning and evening what is probably the heaviest traffic in the world. This installation was made in 1904 following several years' experience with the same kind of apparatus on the Boston Elevated. These stops are mostly on the underground lines, but the experience of this company is of interest not only because of the magnitude of traffic on the express tracks, but also because a few of the stops are situated on surface lines, where some experience has been had with snow and frost during seven winters. Within the past year a considerable number of stops have been introduced on the local tracks, at the instance of the New York state authorities. Here although there are no overlaps, the stops are considered valuable as a means of maintaining strict discipline of motormen.

This type of apparatus is in use on the London Underground lines.

2. Electric induction stop. The automatic stop working by means of permanent magnets and electro magnets, described in the *Railway Age Gazette,* June 16, 1911, pages 1397 and 1406, has been tried experimentally on the Interborough during the past year. This system requires no physical contact between car and roadway. More extensive experiments are soon to be made, as noted below.

Long Island.—The mechanical trip stop used at the Pennsylvania terminal, New York City (see below), is in use to a limited extent on the Long Island. Stops of this design are to be installed, within the next few months, at a considerable number of places on the Long Island where they will be exposed to snow and frost.

New York Central & Hudson River.—1. Experiments have been made on the Putnam division during the past year with the apparatus devised by A. H. Fox, of New York, and mentioned in the third annual report of Block Signal and Train Control Board. In this system the stopping apparatus is kept from acting by a magnetic device, which is carried on the engine in a position close to one of the rails of the track, the presence of the steel rail and its influence on engine magnets being an essential element in the system. To change the apparatus from the "off" to the "on" condition, that is, to apply the brakes, Mr. Fox introduces in the track a short manganese rail which is non-magnetic.

2. Preparations are being made for experiments on the Putnam division with the apparatus of the Induction Signal & Safety Stop Company, of New York. In this system electric induction apparatus is carried on the front truck of the locomotive and is so arranged as to be affected by each electric track-circuit section as the engine enters that section. When block B C is occupied, its track relay, de-energized, introduces a resistance in the track circuit of block A B. A train entering at A then receives a different signal from what it would receive if that resistance had not been introduced, the weakening of the current in the track circuit having the effect of reducing the inductance value of the coil on the front locomotive axle.

3. Preparations are being made for a test, on the line between Buffalo and Niagara Falls, of the apparatus of D. G. Jones, which was noticed in the third annual report of Block Signal and Train Control Board, page 17. This is an intermittent contact-rail system.

Pennsylvania.—1. Mechanical trip stop, worked by compressed air with the electro-pneumatic signals, in use in the Hudson river tunnels, New York City, and also at draw bridges between New York and Newark. Described in *Signal Engineer,* March, 1912 This trip (used only in connection with electric traction) differs from those used on the lines of the Interborough and the Hudson & Manhattan in having an arrangement for protecting the lever on the engine from accidental injury, and also from being moved so as to cause an unnecessary stop, by obstructions along the road. In front of the engine lever which is to engage with the ground apparatus is a bar, rigidly fixed, so as to clear the way for the lever itself, sweeping aside snow, ice or any accidental obstruction. When this rigid bar strikes the ground apparatus, the latter is not injuriously affected; it is arranged as a tumbler, which is simply turned over by the moving vehicle. The tumbler, in being turned down from a vertical to a horizontal position, brings into the vertical position an arm which then is in position to properly actuate the lever on the engine.

2. Experiments have been made on a freight track in Philadelphia with the apparatus of the Railway Automatic Safety Appliance Company, noticed in the third annual report of the Block Signal and Train Control Board, page 18. This is a mechanical trip stop in which the trips are about 3 ft. above the top of the rail, the locomotive apparatus being carried on the front buffer beam.

3. Preparations are being made for trials, on one of the Pennsylvania's steam lines, of the induction apparatus, designed by G. P. Finnegan, which is mentioned above in connection with the Interborough Rapid Transit Company.

Pennsylvania Lines West of Pittsburgh.—Experiments have been made near Pittsburgh during the past few months with the Gray-Thurber apparatus, mentioned in the third annual report of Block Signal and Train Control Board, page 17. In this system the apparatus on the engine is actuated from the roadside by means of an electric current which passes from one rail circuit to the engine or tender, and back to another rail circuit through another pair of wheels, an essential feature of the arrangement being the insulation of the engine from the tender, or of one tender truck from the rest of the vehicle. This insulation feature is similar to that used in the Miller cab signal of 1902, which was described in the *Railroad Gazette* of that year on page 128.

Philadelphia Elevated.—Mechanical trips in use.

San Francisco, Oakland & San Jose.—Overhead mechanical trip. An arm fixed to the semaphore post extends horizontally so as to engage a trip arm on the roof of the motor car, the movement of which makes an application of the air brakes. Described in *Signal Dictionary,* page 113.

Staten Island Rapid Transit Company.—Extended experiments made in 1911 with the Lacroix cab signal and automatic stop, described and illustrated in the fourth annual report of Block Signal and Train Control Board. This is an intermittent contact rail system, the contact rails being fixed on brackets at the side of the track, like the third rail used for electric propulsion on a number of steam railways. These experiments were concluded some time ago and the apparatus has been taken up.

Washington Water Power Company (Spokane).—Overhead mechanical apparatus. In this system an arm extending out horizontally from a semaphore post breaks a glass tube on the roof of the motor car, thereby exhausting the air pressure from the brake pipe. This apparatus was described and illustrated in the third annual report of the Block Signal Board; in the *Railway Age Gazette* of December 16, 1910, and also in the *Signal Dictionary,* page 112.

FUEL ECONOMY ON THE LACKAWANNA.

For Several Months Strong Efforts Have Been Made to Improve Conditions by Means of a Fuel Service Detachment.

BY M. C. M. HATCH,
Superintendent of Fuel Service.

On May 1 of the current year the position of superintendent of fuel service was created on the Delaware, Lackawanna & Western and the duties of the office were so defined as to give jurisdiction, under the superintendent of motive power and equipment, over all matters pertaining to locomotive fuel, with the exception of its actual purchase. The considerations from which originated the creation of this new office were, in brief, a desire to utilize at the drawbar as high a percentage of the heat units in the fuel as is practically possible, and a realization that the only way by which such a result could be attained was by going after the work systematically and by keeping everlastingly after it.

Fuel economy is by no means merely a matter of proper firing. It begins at the mines where the coal is loaded and extends, in varying degree, through every stage of its progress from that point to the ash pit. Locomotive condition enters very prominently into fuel economy, it being self evident that the best results in the economical use of fuel cannot be reached with an engine which is in other than the best possible condition in every respect. It is with full understanding of these facts that the work is being taken up on the Lackawanna; the arrangement of the organization is illustrated by the accompanying diagram.

It is the belief of those in charge that the surest and best way to obtain results is by co-operating with and awakening interest in the men who handle the fuel. If the engine crews know that it is the desire and intention of the mechanical department to provide engines in proper condition and supply them with as uniformly a good grade of coal as possible, it is only natural that they will give better service than will be rendered under more unfavorable conditions, and in furtherance of this idea of co-operation the following self-explanatory bulletin was issued on July 15:

"You are hereby invited and requested to submit such suggestions, bearing in any way on the matters of fuel economy, locomotive operation, etc., as may seem to you would make for the betterment of the service.

"To the end that this may be handled systematically, boxes will be located at certain of our more important engine houses, in which your written suggestions, addressed to the superintendent of fuel service, may be placed. These will be forwarded at regular intervals and will, individually, receive due consideration.

Reading from left to right: Wm. Surplus, fireman; Harry Morgan, engineer; H. C. Manchester, superintendent motive power and equipment; Geo. Durham, master mechanic; F. J. Schramm, chief clerk motive power department; M. C. M. Hatch, superintendent fuel service.

Engine Which Was Awarded the "Ringed Star" on the Scranton Division.

"Please express your ideas in as plain, concise language as possible, giving reasons for the benefits you would expect to see gained by their adoption.

"It is hoped that all will avail themselves of this opportunity to co-operate with the officers of the mechanical department in their endeavor to bring conditions to the highest practicable degree of excellence."

Every suggestion offered is given consideration and a personal reply is finally made to each one. That this will have a good moral effect, aside from the actual value of a percentage of the suggestions, would seem to admit of no argument and results thus far bear this out.

As a further means of awakening interest and inciting competition among the engine crews, it was arranged to keep as accurate an individual record of each man's performance as possible and, at stated periods, accord the men

whose showing is best in the various classes of service the privilege of carrying on their engines certain distinguishing marks indicative of the appreciation of the company. The following bulletin, issued June 1, outlines this plan:

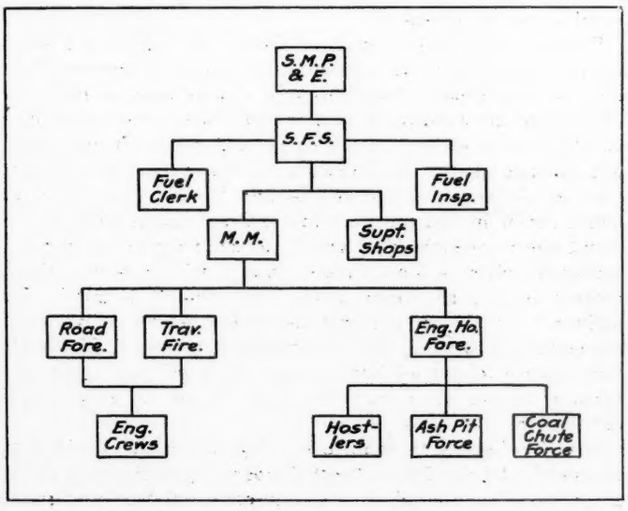
"Beginning with the first day of August, visible recognition will be accorded to those engine crews having the best service records, under the following plan:

"The crew on each division which makes the best showing as regards fuel and oil economy, engine failures, proper handling of train and general appearance of engine between June 1 and the above date, will have placed on the smokebox front of its locomotive a suitable emblem which will designate such high standing.

"The two next best records will be acknowledged by other emblems of somewhat different form. These will be redistributed on the first day of November and at the end of each three months thereafter, on the same basis as governed the original awards.

"The following classes of service will be recognized and each class will carry three emblems on each division: Through passenger, local passenger, fast freight, slow freight, switching.

"In addition to the marks mentioned above, there will be



Organization of Fuel Service Department on the Lackawanna.

one other entirely distinctive emblem which will be awarded to the crew making the best individual record on the Lackawanna irrespective of division or class of service, the holder to be designated at the end of each tri-monthly period.

"The above outlined system will be well advertised on the road and also in the technical and general press, so that the public, as well as company employees, may understand its significance and appreciate the honor paid to those who prove themselves worthy of such recognition.

"The object of all this is to encourage those in charge of our locomotives to work for the attainment of the highest possible efficiency with the added incentive of the fact that the company is willing to publicly designate those who accord it the most perfect grades of service.

"Any suggestions from any of our engineers or firemen on this subject will be gladly received and considered."

The inauguration of this system required, as is often the case with anything new, somewhat longer than was anticipated, but the first awards have now been made and the accompanying photograph was taken at the time of placing the "Ringed Star" of highest divisional efficiency on engine 34, operating in the yard at Gouldsboro, Pa., this engine crew meriting recognition as giving the best general service of all switching crews on the Scranton division. Certain conditions made their performance especially meritorious and, in view of this, a special trip was made on September 7 to Gouldsboro by the superintendent of motive power and equipment and others, at the time of placing the star on the engine. The second and third crews in the various services received a plain star.

On a road making use of such a variety of fuels as the Lackawanna, the list embracing bituminous and all sizes of anthracite coal from rice to egg in many mixtures, fuel economy presents a much more complicated problem than on roads using a single kind of coal. While it is impossible as yet to definitely state to what extent the system outlined above will ultimately decrease the expense incident to providing locomotive fuel, the results so far obtained have been most encouraging.

THE RAILWAYS AND THE PUBLIC.*

BY WILLIAM SPROULE,
President Southern Pacific Co.

I read recently of a fussy old lady, very much vexed at the close of a railway trip. In getting off the train she vented her views in the observation that she had heard a good deal about colleges turning out too many civil engineers and the like, but she would suggest "they try their hands at turning out more civil conductors and less sassy brakemen."

That observation has the text for two points which may be worth nothing. One is that the traveling public judges the railways of the country largely by the men in the train service. The other is that the trainmen tread no rosy path and need help.

Where does that help begin? May I say it begins in the ticket office, for the individual passenger? It begins with the management, itself, for the general traveling public.

For the ticket office, the general passenger and ticket agent is the officer of immediate responsibility. Is it not a fact that the tendency is to skimp the force in the ticket office at the centers of travel, so as to offset in part the great increase in expenses in the general departments of the passenger business —an increase brought about by the great clerical demands incident to regulation, state and interstate.

A great store selling any kind of merchandise has a corps of salesmen sufficient to care for customers in the ordinary volume of trade during the greater part of the day. For the rush hours it has a reserve force to aid in the rush business. Why? Because your family and mine expect to be waited upon with reasonable promptness in the hours at which it is usual to trade. Mark you, the reserve force brought in to assist the rush, by rushing the sale of more goods, has not, during the quieter hours, been "lazying around"—it has been very busy opening up new goods, marking goods, sorting stock, going over the reserve stock, and attending to the many details that are a part of a complex and highly organized business. May I venture it, as my own observation of many years in and out of the service, that we have not yet begun to learn our lesson from the world of business I have just touched upon? It, too, serves the public. It has its rush hours and provides for them. It does not simply hire extra men to wait for the rush. It is organized so that the employee is busy and useful all of the time, but available for the rush.

Perhaps I am harping upon an old string; but I am sure you will agree with me that the conductor's task is not made easier when the passenger has had to stand in line or wait around a tiresome length of time to obtain a ticket or a reservation. Under these conditions, the passenger looks forward to the purchasing of a ticket as an ordeal, and looks back upon it with a tinge of irritation, which is reflected in his attitude on the train and toward the company. Let us have rush hour arrangements

* Address before the convention of the American Association of General Passenger and Ticket Agents at Seattle, September 12.

for handling our customers promptly and pleasantly, at the hours when our business is most active. Attract the people to buy.

Thus attracting the people to buy is not a matter of advertising only.

Railway advertising is little more than a reminder. Much of it seems to be directed at the man who has already decided to take a trip. It is a competitive "spiel" of the loud lung to keep the customer from the bargain counter across the street. It largely ignores the fact that it is human interest which creates travel. If we be quick to see where are the points of human interest from day to day, and put in touch with them the world we address that day, currents of travel, varied and interesting, will be created, while those affected will discover that the railway is serving its community and its ambitions in a sympathetic way.

Local interchange is not confined to commodities. In a country of varied products and industries and climates and ambitions such as are found, for example, in every state on this Pacific coast, there is opportunity, as yet hardly touched, for that interchange of travel which is good for the people and for the railways—serving the interest of both. May I venture the suggestion that we can develop this side of our business more and more, and therein we can be helpful. As we prove helpful it will be reflected in the passengers upon our trains.

In the broad sphere of management as related to the general public, we are entering upon a new era. "Old things have passed away; behold, all things have become new," is an inspired saying, of which only the first part is as yet true. Today, the railways are as completely under the vigilant scrutiny of the state and federal governments as if the public owned them. Today, the accounts, the affairs, the practices and the rates of the railways are as closely supervised by and reported to the state and federal governments as if the public were the owner. Under the present system of governmental control the relations of the railways to the country are as open as the day to the inspectors and examiners and commissioners of the people. Old things have passed away, but old prejudices remain. The railways are exploited on public platforms and in the public prints, too often as if they menaced the public weal in some vague and unexplained way.

The truth is, the general public has little knowledge of the definite and large control exercised over railways. And why? Because the railways have maintained almost perfect silence, and from their silence it has been inferred that there is something wrong. Silence has been mistaken for secrecy. Occasional official utterance is almost without an audience. The public needs to be informed steadily and sincerely by men and methods the public understands.

There are no secrets about these things. Publicity, good wholesome publicity, is necessary to awaken the public mind to the fact that the railways are doing good work in a right way and an earnest spirit. Let us do some writing and talking for ourselves, that our aims and deeds may be understood, instead of misinterpreted. The railways are doing good and faithful work, free from any indirection. Why should not such a business, splendid in its proportions, be better understood by the public, who are ready to give ear to what they understand.

I do not know of any help toward a better day, more general than can be given by the general passenger and ticket agents of the railways of this country. They distribute to a large extent the advertising of the roads, to a larger extent they control the written material issued for the public eye. They appear on the public platform and at public gatherings. The nature of their department keeps them in touch with the traveler, conjointly with the agent, who sells the ticket, and the conductor, who takes it up.

The general passenger department can easily become the strongest factor in making public opinion by direct service and forceful work.

It has been pointed out that it is all right to swat the fly, but we must remember that the real object is to stop the things that bring and breed the fly. So with us. We must regard the present tendencies against the great properties we administer, not in the spirit in resenting attack and smarting under the sting of criticism, but as admonition that we should bring ourselves squarely before the public; conscious that our activities have no direction that is against the public interest, and that we are as anxious as any critic can be for the public weal to be subserved by our business. Free from any note of harshness we can be effective, and civil, too, whether in the executive office, the passenger office or the train service, all parts of one organized machine, each fitted to its duty of serving the public pleasantly, intelligently and well.

MOTOR TRUCK SERVICE IN COMPETITION WITH A RAILWAY.

The motor truck has been extensively used as a feeder for railway service and for terminal deliveries, but it is not often that it has come into direct competition in the ordinary railway transportation and come out a winner in the contest. This has, however, been done by a line established under especially favorable conditions and which has now been running for nearly a year between Glen Cove on Long Island and New York City. The conditions that have rendered this possible are as follows:

The estate of E. R. Ladew, at Glen Cove, operates a large leather belting factory, the output of which is between four and five tons a day. The factory is located about a mile and a half from the railway station, and the New York warehouse is at 82 Fulton street. Hence in making rail shipments there is a cartage charge at each end. In the matter of promptness of delivery the railway freight leaves Glen Cove at about seven in the morning and reaches Long Island City about eleven o'clock, from which the car must be transferred across the river to New York so that it will be two or three o'clock in the afternoon before the freight is ready for delivery; by the time it can be taken to the New York warehouse it is too late to reship that day. Shipments thus require about 24 hours from the time they leave the factory before they can be delivered to a New York destination.

It was primarily to avoid this delay that it was decided to use motor trucks for a direct delivery from the factory to the warehouse, though it was not expected that any great saving would be effected as compared with the railway rates plus the terminal cartage charges at each end. Accordingly an automobile truck was purchased and put into service. It was found that the truck could leave the factory at Glen Cove at seven in the morning and reach the New York warehouse by noon, take on a return load and be home between six and seven in the evening. This made it possible to ship from the factory in the morning, and have the goods forwarded from New York the same afternoon, practically effecting a saving of 24 hours in the time of delivery to the consumer. Indications also were that the cost of transportation would be less than by rail. After the truck had been in service for a short time there came requests from outside parties for the conveyance of freight and packages and this demand was such that two more automobile trucks were purchased so that now there are three in service. One is a Packard with a capacity of 3½ tons and a speed of about 12½ miles an hour. The other two are of 5 tons capacity each—a Benz-Gaggenau and an Alco, the former having a speed of 15 and the latter of 9 miles an hour.

Under ordinary conditions the two heavy trucks make the round trip between Glen Cove and New York every day, the total run averaging about 70 miles. The smaller truck is used for light and local deliveries. The trucks ordinarily carry a load in each direction, and it is considered probable that the traffic could be greatly increased by solicitation and canvassing; but though the line has been incorporated and

is operated as the Glen Cove Transportation Company, it is primarily for the accommodation of the Ladew factory so that but little attention has been paid to the building up of a transportation business. Where business is offered it is taken and there has also been some solicitation where it has been known that certain freight movements were to be made.

As ordinarily conducted, shipments to Glen Cove are delivered at the New York warehouse at 82 Fulton street and to the consignee. Calls are also made en route for freight to be carried from point to point and also in New York and Brooklyn. The localities covered are Oyster Bay, Locust Valley, Glen Cove, Roslyn, East Williston, Mineola, Floral Park, Hollis, Queens, Jamaica, Long Island City and points in Brooklyn and New York. Regular way bills and receipts are issued and the business is conducted in every way like that of any transportation company. The cars are operated on a regular schedule which it has been found that they can maintain. The regular truck leaves the factory at 7:30 a. m. and is due at 82 Fulton street at 11 a. m. On the return trip it leaves at 12:30 p. m. and is due at Glen Cove at 4 p. m. There are, of course, variations from the exact time, due to the amount of freight handled. The second truck runs like the extras on a railway and its schedule is arranged from day to day to meet the demand. The published schedule of rates is as follows:

	Per cwt. or fraction thereof.
From 82 Fulton street, New York City, to:	
Consignee in or near above quoted towns on our route	$0.25
Consignee elsewhere on Long Island within 30 miles from New York and not over 30 miles from Glen Cove	.50
For delivery to factory, Glen Cove, L. I., to be called for, from:	
Consignor in New York, below 60th street	.25
Consignor in New York, above 60th street	.50
Consignor in Brooklyn	.25
For delivery to consignee in or near above quoted towns on route from:	
Consignor in New York, below 60th street	.50
Consignor in New York, above 60th street	.75
Consignor in Brooklyn	.50
Consignor directly on our route	.35
From factory, Glen Cove, to:	
82 Fulton street, to be called for	.20
Consignee in Brooklyn	.25
Consignee in New York, below 60th street	.25
Consignee in New York, above 60th street	.50
From Consignor in or near above quoted towns to:	
82 Fulton street, to be called for	.25
Consignee in Brooklyn	.50
Consignee in New York, below 60th street	.50
Consignor in New York, above 60th street	.75

Truck No._____ Way-Bill Number_____

Driver_____ Date_____ 191__

Glen Cove Transportation Company

TRUCK-EXPRESS WAY-BILL

N.Y. Rate, $_____ per 100 lbs. From_____ To_____

No. of Packages	From Whom Received	To Whom Addressed	Destination	Weight	Advanced Charges	Our Charge	Total to Collect	Prepaid Charges	Add for Under Ch'gs	Prepaid Beyond	Remarks

Way-Bill Used in the Motor Truck Service between Glen Cove and New York City.

For full loads between the two places the charge is $25.

As far as the Ladew interests are concerned it has been found that the cost of transportation by automobile route is from 4 to 5 per cent. less than it was by rail with the added advantage of prompt delivery. In calculating these costs certain assumptions had to be made for which there is no accurate data available as yet. Automobile trucks, for example, are too young for their life to be known, so that it has been assumed at 4 years for the heavy and five for the light truck, thus writing off 25 per cent. for the former and 20 for the latter. Interest is taken at 6 per cent. and labor includes the driver and helper. The repairs are the serious item. The cars must be kept in good running condition, and a man is kept at the garage who goes over each truck every

One of the Large Motor Trucks Used between Glen Cove and New York City.

night and makes the needed repairs. According to a revised schedule of the percentages of operating costs to the total, they are as follows:

Depreciation	16.3 per cent.
Interest	6.3 per cent.
Labor	36.7 per cent.
Gasoline and oil	12.6 per cent.
Rental of garage	1.0 per cent.
Repairs	18.0 per cent.
Insurance	9.1 per cent.
Total	100.0 per cent.

The repair item is very seriously affected by the vibration of the machine, which has a very detrimental effect on the engines, and it is this that is causing the major portion of the troubles.

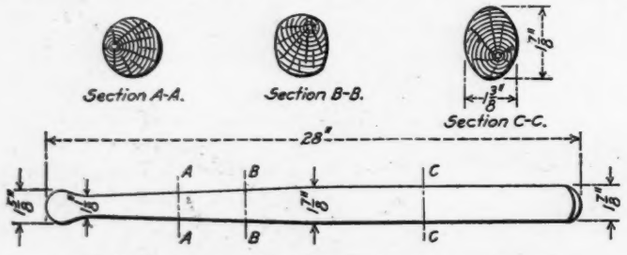
As for regularity of service there is no criticism to offer. There have, of course, been delays due to storms, but on no occasion have these delays been excessive and there was no day during the past winter when the trucks had to lose a trip because of the weather or the bad condition of the roads.

The venture is an interesting example of what can be accomplished with automobile trucks under favorable conditions. The service is severe. It requires a constant duty of about 70 miles per day for six days in the week. The roads are good, but the work is such that the repairs average about 9 cents a mile, or as much as that of a locomotive, but with a much smaller handling capacity. It is not at all probable that such a line could be made to pay under other conditions than those on which it is operated. It was assured a full loading in both directions all of the time by the output of the belting factory, so that its income was guaranteed, but even with that the distance between terminals is about at a maximum of what can be profitably covered, and the company is not seeking and does not care for consignments to greater distances. It is an advantage to the owners both from the standpoint of time and expense, but offers no inducements for the establishment of other similar lines that would have to compete direct with a railway in the solicitation of business and the rates offered.

The company is under the immediate management of A. J. W. Hyde, to whom we are indebted for the data here presented, and is under the general supervision of James R. Taylor, the manager of the E. R. Ladew estate. It shows what can be done under special conditions, and also proves that it is not capable of a wide and general application, and that if it is to be copied it should only be after a close and careful study of local conditions.

A STANDARD BRAKE CLUB.

With the increasing use of heavy cars, the freight brakeman has found the "pick handle" (any stout stick suitable for use as a lever in setting hand brakes) increasingly necessary. Formerly the use of such a lever was forbidden because frequently a brakeman, becoming too enthusiastic in its use, would set a



Standard Brake Club; Pennsylvania Railroad.

brake so tightly as to slide the wheels and thus quickly make a pair of wheels unfit for service.

A brakeman who uses a lever made of anything but the best material is liable to endanger his life as, being able to easily apply almost the whole weight of his body at the end of the lever, anything but the toughest timber may give way. The use of stray sticks, picked up at random is almost sure to be risky. To meet this danger, the Pennsylvania Railroad has adopted a standard "brake club," which is shown in the accompanying sketch. It is 28 in. long and at its smallest diameter is 1⅜ in. thick. The club is marked with the name of the road and its use has been prescribed throughout the company's lines, both east and west of Pittsburgh. The specifications call for selected, straight grained, split hickory entirely free from shakes, splits, knots, rot and black wood.

TRAIN ACCIDENTS IN AUGUST.[1]

Following is a list of the most notable train accidents that occurred on railways of the United States in the month of August, 1912:

Collisions.

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	Kil'd.	Inj'd.
5.	Balt. & Ohio	Claysville, Pa.	bc.	P. & F.	2	5
17.	Balt. & Ohio	Coulter.	bc.	F. & F.	1	4
18.	Cin. H. & D.	Troy.	bc.	P. & F.	1	6
23.	Pere Marquette	Charlevoix.	xc.	P. & F.	..	23
†30.	Nor. Pacific	Maywood, Wis.	bc.	P. & F.	3	4

Derailments.

Date.	Road.	Place.	Cause of Derailm't.	Kind of Train.	Kil'd.	Inj'd.
4.	Rutland	Bangor, N. Y.	unx.	P.	0	14
7.	Virginia & S. W.	St. Charles.	unx.	F.	3	0
†8.	N. Y. N. H. & H.	Dorchester.	unx.	P.	7	54
9.	Mobile & O.	Sparta, Ill.	b. rail.	P.	0	35
10.	St. Louis & S. F.	Rogers, Ark.	unx.	P.	1	6
†12.	C. M. & Puget S.	Keechelus.	unx.	P.	5	5
17.	Penn.	Middle Pt.	unx.	P.	0	7
18.	Atch. T. & S. F.	Osage City.	d. switch	P.	0	17
19.	Southern	Lenoir City.	unx.	P.	0	1
19.	Boston & M.	Lakeport.	unx.	P.	0	2
19.	Tex. & Pac.	Mineola.	b. rail.	P.	0	2
21.	Yazoo & M. V.	Roxie.	unx.	P.	0	5
†25.	Cin. H. & D.	Antioch.	unx.	P.	1	15
30.	Mo. Kan. & Tex.	Temple, Tex.	unx.	P.	1	17
30.	Penn.	Conway.	acc. obst.	P.	5	19

Other Accidents.

Date.	Road.	Place.	Cause of Accident.	Kind of Train.	Kil'd.	Inj'd.
18.	Penn.	Wooster, O.	boiler.	F.	0	2

The trains in collision near Claysville, Pa., on the 5th, were westbound passenger No. 703 and eastbound freight No. 82, the freight being drawn by two engines. One fireman and a baggage man were killed, and 5 trainmen were injured. The freight had encroached on the time of the passenger train, the eight men in charge of it having overlooked the passenger schedule, which was one of long standing.

The trains in collision near Coulter, Pa., on the 17th, were a freight and a work train moving in opposite directions. One laborer was killed and four were injured. It appears that the work train was not properly protected by flag.

The trains in collision near Troy, Ohio, on the 18th, were the first and second sections of Northbound No. 10, the first section consisting of two freight engines coupled together. The three locomotives and three cars of the passenger train were wrecked. One engineman was fatally injured and one other employee and 5 passengers were slightly hurt. The collision was due to the failure of a signalman to hold the second section at the entrance to this block section.

[1] Abbreviations and marks used in Accident List:
rc, Rear collision——bc. Butting collision——xc, Other collisions——b, Broken——d, Defective——unf, Unforeseen obstruction——unx, Unexplained——derail, Open derailing switch——ms, Misplaced switch——acc. obst., Accidental obstruction——malice, Malicious obstruction of track, etc. ——boiler, Explosion of locomotive on road——fire, Cars burned while running——P. or Pass., Passenger train——F. or Ft., Freight train (including empty engines, work trains, etc.)——Asterisk, Wreck wholly or partly destroyed by fire——Dagger, One or more passengers killed.

The trains in collision near Charlevoix, Mich., on the 23rd, were southbound passenger train No. 8 and northbound passenger No. 7. Twenty passengers and 3 employees were slightly injured. The collision was caused by No. 8 entering the station, which was the regular meeting point, not under control.

The trains in collision at Maywood, Wash., on the Northern Pacific on the night of the 30th of August were an eastbound passenger and an extra westbound freight. One passenger and two trainmen were killed and four persons were injured. The passenger train had run past a station at which, according to a despatcher's order, it should have waited to meet the freight.

In the derailment at Dorchester, Mass., on the 8th, the engineman, fireman and 5 passengers were killed. The accident was reported in our issue of the 16th.

The train derailed near Rogers, Ark., on the night of the 10th, was northbound through passenger No. 6. One of the two firemen was killed and 6 passengers were slightly injured. The second engine of the train, the baggage car and mail car were overturned. The cause of the derailment was not determined.

The westbound Olympian express train of the Chicago, Milwaukee and Puget Sound was derailed near Keechelus, Wash., on the 12th. One passenger, 2 enginemen and 2 firemen were killed, and 5 persons injured. The train was drawn by two engines. The derailment was due to some cause not discovered.

The train derailed at Middle Point, Ohio, on the morning of the 17th, was the westbound Pennsylvania special—the 18 hour train, New York to Chicago. One passenger was seriously injured, and six slightly. All of the engine except the pony truck was derailed and all of the seven cars in the train were derailed, except the rear truck of the observation car. One sleeping car fell on its side in the ditch and two others and the dining car were partially overturned. All the cars in the train were of steel. The bodies of the cars were but slightly damaged except the car which was on its side, which was more seriously damaged. The train was running about 63 miles an hour on straight track. The cause of the derailment has not yet been determined.

The train derailed at Osage City, Kan., on the 18th, was eastbound passenger No. 10. Eight cars ran off the track. Seventeen passengers were injured; none of them seriously. The derailment was due to a loose switch, a nut having worked off a bolt.

The train derailed at Lakeport, N. H., on the 19th, was the northbound White Mountain express. The only persons injured were a mail clerk and an express messenger. The cause of the derailment was not determined.

The train derailed at Mineola, Tex., on the Texas & Pacific on the 19th of August, was westbound passenger No. 7, and the tender and all the cars were ditched, the engine remaining on the track. One passenger and one trainman were injured. The derailment was caused by a broken rail.

The train derailed near Roxie, Miss., on the Yazoo & Mississippi Valley at 3 a. m. on the 21st, was southbound passenger No. 15. The tender and first two cars were overturned. Five persons were slightly injured. The derailment was due to some cause not determined.

The train derailed at Antioch, Ill., on the 25th, was an eastbound excursion train, and two coaches were overturned and thrown into the ditch. One passenger was killed and 15 were injured. The derailment is believed to have been caused by a broken flange.

The train derailed near Temple, Tex., on the Missouri, Kansas & Texas on the 30th of August, was a northbound passenger. The mail car and two passenger cars ran off the track at a trestle and fell 15 ft. to the ground below. The engine and the four rear cars (sleeping cars) remained on the track. The news agent on the train was killed and 17 passengers were injured.

The train derailed at Conway, Pennsylvania, on the 30th, was a westbound local passenger. The engineman was killed and the fireman fatally injured; two work-train laborers and a bystander were also killed, and seven passengers and 12 employees were injured. The accident was caused by the train running into a part of a steam wrecking derrick which was engaged in clearing a wreck on a yard track, but which fouled the main line. There was a dense fog at the time, and it was said that the engineman had run past two flagmen, one of them a half mile back of the point of obstruction. The automatic block signals were clear. The air brake was found in full release and the reverse lever of the engine in full forward motion.

The accident at Wooster, Ohio, on the 18th, was the explosion of the boiler of a freight train which was running at full speed. Two firemen and one brakeman were scalded, but not very badly.

Electric Car Accidents.—The only fatal accident to electric cars of which we find report in July was a butting collision, on the Chicago, South Bend & Northern Indiana, at South Bend, Ind., on the 14th; one person was killed, and three were injured.

LOCOMOTIVE FUEL CONSUMPTION AND THE SPEED DIAGRAM*

BY A. K. SHURTLEFF,
Office Engineer, Chicago, Rock Island & Pacific.

Locomotive fuel consumption can be divided as follows. 1, Fuel used for work. 2, Fuel used account of leakage of water and steam, and for steam used for brakes, whistling, etc. 3, Fuel used for re-evaporation due to radiation. 4, Fuel used at engine houses for "firing up," etc.

The tables in the A. R. E. A. Manual of 1911 provide for fuel used under the first three headings during the period of maximum effort. But the fuel used by locomotives while drifting or at rest is a material amount of the total consumption. At the 1904 convention of the American Railway Master Mechanics' Association, some valuable data was presented covering 21 tests over an engine district on the Atchison, Topeka & Santa Fe, and 24 tests on the Norfolk & Western. From this data the following general figures are obtained:

For the Atchison, Topeka & Santa Fe tests:

Average heating surface per test trip.....2,686 sq. ft.
Coal used per hour delay: Total.....374.5 lbs.
Per 1,000 ft. H. S.....139.4 lbs.
Water used per hour delay: Total.....758.8 lbs.
Per 1,000 ft. H. S.....282 lbs.

Coal used per trip firing up at engine houses: Average of 15 tests; 515 lbs. per 1,000 sq. ft. H. S. The coal used had an average value of 11,000 B. t. u.

For the Norfolk & Western tests:

Average heating surface per test trip.....2,445 sq. ft.
Coal used per hour delay: Total.....232 lbs.
Per 1,000 ft. H. S.....94.8 lbs.

Coal used per trip firing up at engine houses: Average, 24 tests; 501 lbs. per 1,000 sq. ft. H. S. The coal had an average value of 14,000 B. t. u.

The fuel loss by radiation depends on the temperature of the outside atmosphere, area of boiler exposed and quantity and quality of boiler covering. The exposed area varies and is not one of the items given with locomotive dimensions. With modern locomotives there is from 4.75 to 5.75 sq. ft. of exposed area to one square foot of heating surface. The proportion of this outside area insulated against transmission of heat varies. Evaporation is from heating surface, and owing to the variables and undetermined area of the boiler exposed, the losses will be based on heating surface.

The heat loss from radiation is the total loss when the locomotive is not working less the loss due to leakage and use of steam and water for other purposes than work. In the A. T. & S. F. tests, it would require 34.7 lbs. of 11,000 B. t. u. coal per 1,000 sq. ft. of heating surface to evaporate the 282 lbs. of water used per hour idle from a feed water temperature of 65 deg. to a boiler pressure of 200 lbs. The N. & W. tests do not give

*Abstract of a paper published in bulletin No. 148 of the American Railway Engineering Association. Copyrighted, 1912, by A. K. Shurtleff.

the water and steam losses while at rest. In 97 tests at the St. Louis Exposition testing plant the average steam loss per hour per 100 sq. ft. of heating surface was 151 lbs. These locomotives were probably in as good or better condition than the average road locomotive, and the N. & W. locomotives can be considered as losing at least this amount of water and steam. There would be required 14.6 lbs. of 14,000 B. t. u. coal per 1,000 sq. ft. heating surface to evaporate this quantity of water wasted. A fair average for this loss of heat due to other uses of steam and leakage can be based on 200 lbs. loss an hour per 1,000 sq. ft. of heating surface.

The coal loss from radiation during delays in these tests can then be estimated as follows:

A. T. & S. F.. 139.4 — 34.7 = 104.7 lbs. per 1,000 ft. H. S.
N. & W..... 94.8 — 14.6 = 80.2 lbs. per 1,000 ft. H. S.

G. R. Henderson, in his book on Locomotive Operation, states that in tests with one locomotive he found the loss from radiation at 28 m. p. h. velocity double the loss with the locomotive standing. Practically all drifting is done on gradients at a velocity exceeding this; therefore, no great error will occur in basing the loss while drifting at double the amount standing.

The fuel used in firing up in the tests at engine houses does not seem consistent with the total heat units when comparing the two series of tests. This is due to many causes. Engine house practice varies widely on different roads, and in the houses of the same road. Probably the least study in reduction of fuel wastes is given to fuel used while the engine is housed.

The following table is arranged from results secured in these tests and the assumption that evaporation is proportional to the total heat units in the coal, except in the case of coal "firing up," which, until better methods obtain, is based on the amount actually used in the tests. In proportioning the fuel on the B. t. u. contained, the fact that ash and other components of the fuel vary must be neglected along with the other variables.

Approximate Pounds Coal Burned per 1,000 Sq. Ft. Heating Surface—Locomotive Not Working.

B. t. u. per lb. coal.	Per trip firing up.	Radiation, leakage, etc., per hour. Standing.	Drifting.
10,000	520	145	263
11,000	515	132	239
12,000	510	121	219
13,000	505	111	202
14,000	500	103	188
15,000	495	97	175

As a test of the value of the above table in approximating fuel consumption the following data is given covering one week's actual operation on a division of three engine districts. The data given is actual, except that time drifting is estimated by platting a time diagram, and this is deducted from the actual running time to get the time "working."

Total freight locomotive miles		27,575
Total freight locomotive trips		220
Heating surface per locomotive		2,905
Hours delay (standing)		855.4
Hours drifting	408.2	
Hours working	1,312.6	
Total hours running time		1,720.8

Average value of coal, 11,000 B. t. u.

Estimated Fuel Used.

Firing up: 220 trips at 1,496 lbs.	329,120 lbs.
Standing: 855.4 hours at 383.46	328,012 lbs.
Drifting: 408.2 hours at 694.3	283,413 lbs.
Working: 1,312.6 hours at 4,000	5,250,400 lbs.
Total estimate	6,190,945 lbs.
Estimate per freight locomotive mile	224.5 lbs.

The actual coal used per freight locomotive mile on this division during the month from which this data was taken was 224.1 lbs. It can not be expected that as close an approximation can be obtained in all cases, but this method can be applied to different locations or different divisions, and a reasonable comparison made of the relative fuel economy, providing the data to estimate it is at hand.

The table covering the fuel used is of little value except as information to the student of economics, unless a method be provided for estimating the various components of the total time over a district. From data secured on two western roads, single track divisions, and covering two weeks' time on seven engine districts of one line, and one week's time on three engine districts of the other, the average time taken for orders, coaling and watering locomotives was one-half minute per engine per mile of the district. The total number of meeting points and points of passing by superior trains was 8,709, and the average time delay for each freight train was 15.9 minutes for each of such points. On the lighter traffic districts where time was ample, more time was taken than noted above at meeting or passing points. A safe figure for estimating the delay time is ½ minute per engine mile, plus 15 minutes for each train met or train allowed to pass in the same direction.

The number of such points can be closely approximated by estimating the number of trains required to handle a given traffic, both freight and passenger, and platting the same graphically on a chart similar to those used in making time cars. One side is drawn to the scale of miles over the locomotive district; the other into a scale of 24 hours. Where information is not available as to the time trains may reach the district, the total number of trains may be spaced out through the 24 hours. The trains in one direction may be platted in straight lines covering the district in the time of the desired schedule. The passenger trains and one freight train in the opposite direction may then be platted and the intersections of the one freight with other trains counted.

With this method, lines representing schedules for the different classes of freight service may be used and the points determined for each class. The foregoing method refers to single track. On double track only trains in the direction of traffic should be considered.

Running time, divided between time working and drifting may be estimated by the construction of a time diagram.* The method requires labor, but after preparing the tables suitable for the problems it is possible to plat the speed lines and calculate the time over 50 miles or more of profile per day. The problem in economics of railway operation or location is not solved until reasonable proof has been obtained that the assumed train can move over the district within the allotted time, and on a district with adverse grade, most of which may be controlling and practically all in one direction, or on districts of a very low rate of gradient, the locomotive must be operated at a shortened cut-off to get over the district without overtime.

The use of the speed diagram will show the fallacy of considering rise and fall of the same amount of equal values. The values for the same amount will vary with the gradients, speed of approach and location. As a general proposition, with the same character and loading of a train, and where runs of 15 miles or more can be made without stops, the time over two districts of the same rise and fall will be practically the same, but the fuel consumption on the district of lighter grade will be less. The use of the speed diagram will solve the problems of fuel and water accounts, and with schedules of pay of engine and trainmen at hand the main problems of "conducting transportation" most affected by the physical characteristics of locations can be solved.

The method described requires work and time, but it does away with the "scientific guesswork" with reference to the effect of distance, gradient, rise and fall, and curvature on the main accounts under "conducting transportation" expenses. The actual economies realized will be much nearer the estimated economies than the average guess work. The most important value is that it will in many cases save the waste of money in the investment of so called improvements which fail to realize a fair return on their cost.

The value of the method does not end with the engineer's es-

* The construction of the time diagram as used by Mr. Shurtleff was described in the *Railway Age Gazette* of August 23, 1912, page 347, where typical tables of acceleration and retardation for locomotives working under full throttle and drifting were published. The tables included in Mr. Shurtleff's article have been calculated for somewhat different conditions, although the method used is exactly the same.

timate of relative economies of different routes; but with the data for a district once worked out, many of the important problems of movement of traffic can be solved with sufficient accuracy to put the calculated results in practice, and with possibly a few slight changes found necessary in practice, render greater efficiency in operation. The value of additional main tracks can be estimated logically so that an executive officer without technical education can understand the methods of reasoning even though he may not know the mathematical methods which determined the running time. The time spent in preparing the tables and in making the calculations for any given line is in itself a foundation for greater economies, and the cost of this time will bring abundant results.

ELECTRICAL EQUIPMENT OF RAILWAY SHOPS.

George W. Cravens, president of the Cravens Electric Company, Chicago, read a paper on the above subject at the Western Railway Club meeting of September 17, 1912, of which the following is an abstract:

There is no department of a railway shop in which some application of electricity cannot be made, and in most of them it is practically indispensable, if economical operation is to be realized. The more important reasons for this are the ease of control, flexibility, wide application, efficiency and economy. And all of these apply to power, heat and light, although in different degrees. The single characteristic, ease of control, is in itself sufficient justification for its adoption wherever practicable.

No two shops can be arranged exactly alike and be equally efficient for their particular purpose, nor can any definite set of rules be laid down which can be followed implicitly. On the other hand, experience shows that there are certain general laws which may be used as a guide in studying conditions and will help in formulating the preliminary layout. The first and best thing to do is to make a careful, comprehensive and detailed study of existing shops, old and new, especially those operating under conditions similar to the assumed conditions of the new one. The general adoption of electricity as the distributing medium for the power, not only allows a central generating plant but makes possible the arrangement and rearrangement of the machine tool equipment to suit varying conditions at comparatively small expense, increases outputs, reduces operating expenses and investment in buildings, line shafting and belts, provides better speed control and lighting, etc.

The general arrangement of the plant will effect the distribution of power on account of the relation of the departments. The size of the plant will determine the amount of power required, modified of course by the nature and amount of work done. The proportion of new equipment built, as related to repairs to old rolling stock, will also have its effect.

ELECTRICAL EQUIPMENT.

As to whether alternating or direct current should be used, there are many different opinions, most of them based upon the practical and more or less limited experiences of the users. Recent improvements in alternating current motors for driving shop tools have brought them to practically the same degree of flexibility as to speeds as the direct current motor, so practically the only factors now to be considered are the power factor of the system as a unit, slight differences in maintenance and the small drop of voltage in distribution.

Having determined the machine tool layout and other factors effecting the amount and distribution of power the next thing to do is to make a complete wiring or power distribution diagram, which should be clear and unmistakable, and as complete a record as it is possible to make. After the general wiring diagram is finished the details of the power distribution in each building should be taken up separately and worked out in detail.

POWER PLANT.

The power house must be made to suit the equipment and not the reverse, as is often the case. Allow plenty of room for convenient operation as well as for extensions. Leave an open space at or near the center of the room, preferably in front of the switchboard, from which the operating engineer can see the entire equipment at all times. The best location for the power house is as near the center of the load of the plant as possible.

The switchboard is an important part of the power plant. It should contain not merely panels enough for all of the generators and feeder circuits, but every panel must have a complete equipment of meters, switches, etc., to allow the fullest knowledge and control of conditions in each circuit. If the power is to be transmitted for any great distance the voltage should be as high as possible for safety in the shop, to reduce the amount of copper required in the lines and to keep the terminal voltage up to as near normal as possible. Either a. c. or d. c. distribution can be made at 440 volts and this is high enough for any shop at present constructed, if the power plant has been properly located.

ELECTRIC MOTORS.

Continuous-current or direct-current motors are usually designed for use on constant potential circuits, three kinds being available for driving machine tools: series-wound, shunt-wound and compound-wound. Alternating current motors are usually designed for use on constant voltage systems. They may be designed to run at fixed speed or at varying speeds, the latter finding the widest application in machine shops. For variable speed work the three-phase motor is better, the asynchronous or induction motor finding the widest application.

Series-wound motors are best adapted for use where the operator has the motor always under his control, as for hoists, cranes, elevators, locomotives and other classes of intermittent service. The speed of a series motor can be varied only by dissipating energy in the form of heat through a resistance in series therewith, thus reducing the impressed voltage and, in turn, the amount of current reaching the motor.

Shunt-wound motors, because of their speed characteristics and ease of control, are particularly well adapted to driving machine tools. On the other hand, experience shows them to be best fitted to drive tools which do their work with a rotary motion of either the work or the cutting tool. This includes drills, lathes, boring mills, milling machines, etc., rather than machines with a reciprocating motion like planers, etc.

Compound-wound motors are best suited for driving planers, slotters, shapers, rolling-mills, punch-presses and other machines with a reciprocating motion of either the tool or the work. This is due to the fact that the greatest demand for power is at the instant of reversal of motion, and the series winding causes an increase of torque as the speed drops due to the increased load at that instant. The load curve of a compound motor may be greatly smoothed out by adding a flywheel, and it will tend to save the motor. For machines of the class stated, motors of larger capacity are required than for machines operating with a rotary motion and removing the same amount of metal, so flywheels will tend to reduce the size motor required for a given machine.

Synchronous motors operate at constant speed regardless of load, up to the stalling point, so long as the speed of the generator driving them remains constant. But they require the separate excitation of their field windings with direct current, the same as an alternating current generator, so are seldom used in machinery shops except in the larger sizes. They may be used, however, where constant loads are to be carried at constant speeds, such as for blowers and pumps operating continuously, and for driving generators which

operate at constant potential. There should always be one in plants using induction motors for power in order to bring up the power factor.

Induction or asynchronous motors are of two general types, those with "squirrel cage" or short circuited armature windings and those with armature resistance external thereto for speed regulation. The latter class is further subdivided into two styles, those with the resistance elements mounted inside the rotor, or armature, and those with contacts, or "slip rings," on the armature, and leads running to resistances mounted elsewhere. Small sized induction motors are nearly always of the squirrel cage type with the primary windings only connected to a circuit. The only way to change the speed of such motors is through voltage variation through transformers or resistances, and this effects the torque of the motor.

The no-load speed of an induction motor is practically synchronous with that of its source of supply and its full load speed from 3 to 15 per cent. less, depending upon its size. In order to develop torque an induction motor armature must "slip" or fall behind the synchronous speed, and the amount of this slip varies directly with the load and the resistance of the armature, and inversely as the square of the voltage applied. Induction motors with external resistance as described will operate at full-load torque with the speed reduced as much as 50 per cent. without overheating. Induction motors with squirrel cage rotors are suitable for use where speed variation is unnecessary during a given operation, such as for pumps, fans, drills, grinders and other places where motors with the characteristics of shunt-wound direct current motors are required. Speed variation, however, can only be obtained through varying the voltage or with speed changing gears on the machine, both of which are undesirable. Squirrel cage motors are good for use in oil houses, wood-working shops and other places where inflammable materials are found as there is no moving contact and no sparking.

Induction motors with variable secondary resistance, on the other hand, may be run at speeds of anywhere between half speed and full speed, at full load, and are suited to most any class of service that either shunt or compound direct current motors are. Recently a new form of induction motor has been brought out for use on planers and other machines requiring a reversible motor. This motor is so designed that it will stop from full speed, reverse, and come up to full speed again in the time ordinarily taken to shift the belt on a planer, and its switch is operated by the dogs on the planer bed.

Some time ago Prof. Flather conducted a series of tests to determine the power required to drive machine tools when cutting various metals, and he found that the results agreed very closely with the following formula:

$$HP = F \times D \times S \times C.$$

Where:—
F = feed in inches.
D = depth of cut in inches.
S = cutting speed in inches per minute.
C = a constant whose value depends on the material worked.

If more than one tool is cutting at one time, the power required will increase in proportion to the number working.

The values of C are as follows:—

Cast iron	0.35 to 0.40
Soft steel and wrought iron	0.45 to 0.50
Hard and machinery steel	0.70 to 0.80
Crucible steel	1.00 to 1.10

Based upon the weight of metal removed in pounds per minute, the above formula can be changed to the following:

$$HP = F \times D \times S \times W \times K.$$

Wherein most of the symbols carry the same meanings as before, the others being, W = weight per cubic inch of the metal being worked on, and K = HP coefficient for that kind of metal, as given below:—

Hard steel	2.65 h. p.
Soft steel and wrought iron	2.40 h. p.
Cast iron, hard	1.36 h. p.
Cast iron, soft	1.00 h. p.

The weights of the various metals as used in the above are as follows, in pounds per cubic inch:—

Steel	0.284
Wrought iron	0.278
Cast iron	0.258

It will be noted that the figures given as the values for the constant K equal the actual horse power required at the motor for each pound of metal removed per minute, regardless of the rate of cutting. A number of tests showed these figures to be remarkably close where the machines were in good condition and adapted to the work.

The cost of electric power for operating a shop will not be equivalent to the full load capacity of all of the motors installed. Figures based upon the records of nearly 200 shops show the average load to be but 30 per cent. of the rated capacities of the motors installed. There are over 2,500 motors in these shops averaging slightly over 7 h. p. each, but the majority of them are smaller. The cost of maintenance of these motors averages from 15 per cent. to 30 per cent. of the former cost of maintaining belts in these same shops, and the other benefits are almost incalculable.

THE SIMMEN CAB SIGNAL.

The Simmen cab signal system, which was briefly mentioned in the *Railway Age Gazette*, August 23, page 365, has now been in use on the line of the Indianapolis & Cincinnati Traction Company for three months, and preparations are being made for a further installation. In the accompanying illustrations there are shown the arrangement of wires on the motor cars, the design of the contact rail apparatus and the appearance of the despatcher's circuit-closing keys, or levers, and of the graphic record by which he keeps track of the position of the trains on the line.

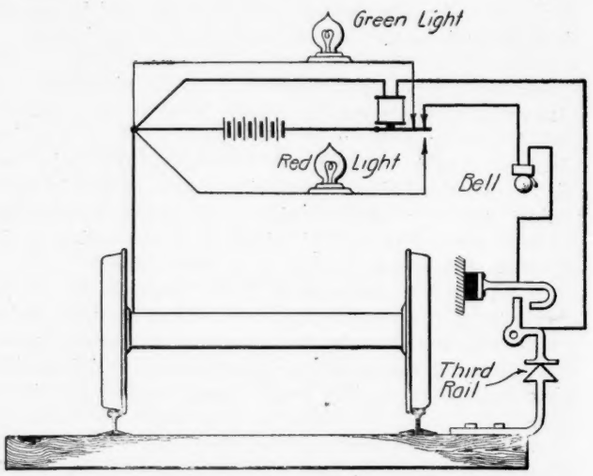


Fig. 1—Circuits on Locomotive.

The Simmen system has been in use for about three years on the Toronto & York Radial Railway at Toronto, Ont., and the apparatus as there installed was described in the *Railroad Age Gazette, August* 6, 1909. The same system, with an automatic stop, was also tried for over a year on the Atchison, Topeka & Santa Fe, in California, in 1908. The Canadian and the Indiana installations have no automatic stop apparatus, and that in Indiana has no telephone connection to the cars.

The Indiana installation may be classed the same as a manual block system, in which the indications are given in the cab rather than by fixed visual signals at the roadside, and all of the signaling operations of which are made by a single person at a central office.

The line is single track. At each signaling point there is a contact rail about 72 ft. long. This rail is connected with the despatcher's office by an electric wire, the number of wires coming into this office being the same as the number of signaling points. There is a contact rail at each block-entrance, and also one in the rear to give distant or cautionary indications. This electrical contact serves to convey signals from the despatcher

to the motorman, and also to convey an impulse from each car at each rail to the graphic recording apparatus in the despatcher's office. The graphic recording apparatus is so arranged that the passage of the contact shoe on a car over the rail will be shown on the train-record sheet by a punch mark, made by a needle moved by an electro-magnet. Two sets of electro-magnets, working through front contacts of the same line relay, are provided for each block entrance. One set is arranged above the train-record sheet and the other below; one provides for a set of punchings for movements in one direction and the other for the other direction. The block lengths are marked on the width of the train-record sheet to a predetermined scale, each block being represented by a column, and the sheet is laid off lengthwise on a scale of six inches to an hour. The sheet is moved from top to bottom of the table by clockwork, the movements taking place at five-second intervals.

In the operation of the system a train passing the contact rail at a distant signal location would record its movement by a punch mark from the needle operated by that one of the upper electro-magnets which corresponded to that block entrance. Its contact with the home signal rail would be recorded in the same manner. The lower needle, corresponding to the direction in

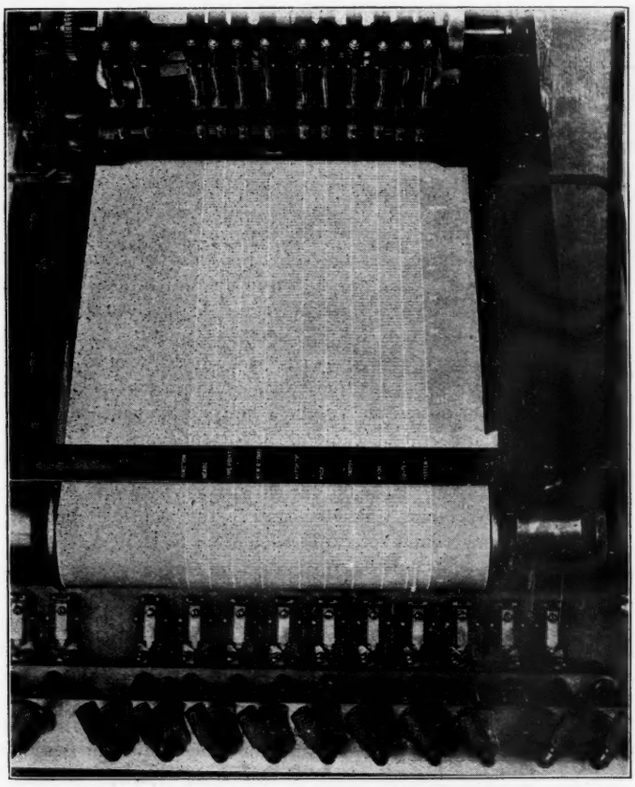


Fig. 2—Train Record Sheet, and Despatcher's Controlling Levers.

which the train might be running, would make a punch in the column corresponding to the block at the moment the train entered the block, and additional marks along the same vertical line at five-second intervals until the train passed out of the block. The next magnet in the proper direction would then take up the punching, so that the length of time the train was in each successive block would be recorded on the vertical time scale of the train sheet, within the limits of the section corresponding to the block. This graphic record thus indicates the time of passing each home and distant signaling point and the time of entering and leaving each block.

The despatcher controls the circuits for the contact rails through the levers shown in the lower part of Fig. 2.

When the despatcher is to give signals to two trains moving in opposite directions toward each other he places the lever by which he sends signals to the meeting point in a vertical position; then the lever on the left of this, being used (for example) for eastbound movements, is turned in one direction, while that on the right of the central lever (for westbound movements), is turned in the opposite direction. The despatcher has full control of all train movements, and can use either absolute or permissive block signaling.

In this installation, as in all cases where track circuits are not used, open switch protection is provided by running the line

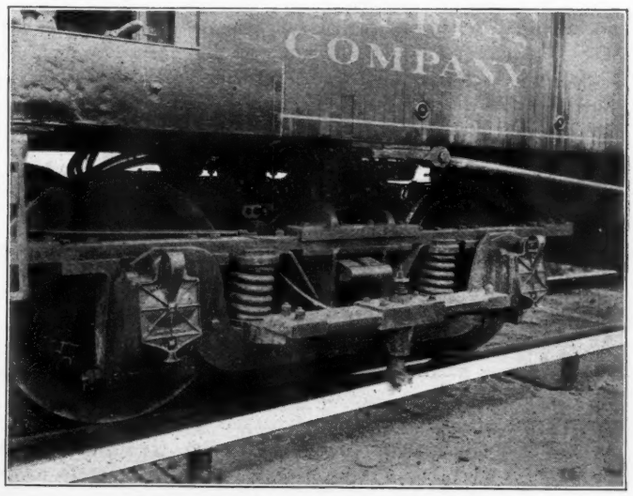


Fig. 3—Contact Rail and Contact Shoe.

wire through a standard switch-box. Opening a switch thus prevents current from reaching the contact rail, and this results in a stop or caution signal in the cab.

The cab signal consists of an arrangement of lights in the cab, one of which shows green for clear, and the other red for stop or caution. When the despatcher desires to hold the train for any reason he breaks the circuit and causes the red to show; and when the block ahead is occupied or the integrity of the track circuit is impaired (in case track circuits are used), red is displayed.

The circuit on the car for controlling the cab signal is shown in the diagram, Fig. 1. The contact shoe is in contact with the contact rail and current from the despatcher's office energizes the relay in the cab, returning to ground through the track rails. This relay is a "stick relay," and, once energized, is held closed by its local battery through its own front contact, as long as the circuit closer which operates in connection with the contact shoe is closed. This is closed when the shoe passes down the incline as it runs off of the contact rail. The circuit from the despatcher's office is not interrupted until after this contact has been made by the downward movement of the shoe. After the shoe leaves the contact rail the stick relay holds the circuit for the green light closed, and this clear signal is maintained until the next contact rail is reached. The passage of the contact shoe up the incline at this next contact opens the circuit through the local battery; but if none of the conditions which would require a red light to be shown are present, current from the despatcher's wire passing up through the rail and shoe, holds the stick relay energized, and there is no interruption of the green light. The complete operation of opening the local circuit and closing it again as the contact shoe passes up the incline on the near end of the rail and down the incline on the far end is gone through at each contact rail location, so that a new clear signal is given for each clear block. If, however, at the time the contact shoe on the locomotive made the connection with the rail the despatcher's circuit had been interrupted, either on account of his desire to communicate with the train, or by an open switch or (with a track circuit system) a train in the block, or any other

interference with the track circuit of the block in advance, the current would have been cut off from the contact rail; and as the contact shoe passed over it the stick relay would have been de-energized, and would remain so. The circuit for the red light would then be closed through the back contact of this relay; this would require the engineman to stop immediately and communicate with the despatcher at the next point provided for that purpose. On the experimental installations which have been made, the telephone line is accessible, through telephone jack boxes on poles, at all contact rail locations and at half-mile intervals throughout the blocks.

The visual cab signal may be supplemented by audible signals, such as a bell or a whistle to announce the change from green to red. As the stick relay feature provides a means of holding the indication which is received at the entrance to the block, a distant signal indication can be kept in front of the engineman so that he could not forget it, even in the longest block.

The Simmen system is made by Northey-Plummer, Limited, Indianapolis, Ind.

HANDLING CAR INTERCHANGE RECORDS ON THE CHICAGO & NORTH WESTERN.

The Chicago & North Western has recently obtained remarkable results in the handling of car interchange records in connection with the Betts system of car accounting, by the introduction of methods which make it possible to furnish information to shippers concerning cars being traced from 24 to 48 hours earlier than is usual. It is believed that these methods will have an important effect in improving the service during the period of congestion this fall.

A car record is kept for two reasons: First, for per diem and ownership purposes, and second, in order to give information to shippers. For the second purpose, therefore, it is highly important that this information be gathered in some way and made available without the necessity of obtaining the information by telegraph, and the quicker the information can be given to a shipper concerning cars he is tracing, the more likely he is to continue on pleasant relations with the road.

Under routine methods of handling interchange forms the records are frequently two or more days old before being entered in the car record books.

The general plan of the Betts system, invented by E. E. Betts, superintendent of transportation of the Chicago & North Western, which is now in use on 42 roads, is well known. Four or more wide copies and two narrow copies of the interchange report are made, one narrow and one broad copy going to each car accountant. These forms are filled out at the time of the interchange and require no transcribing until the record is finally entered into the books, as carbons are used, the wide copy including the data for the statistical department and the narrow copy only that part of the data required immediately for the purpose of the car record.

Whenever a cut of cars is delivered to a connecting line a set of interchange forms is made out therefor, and whenever the narrow sheets are exchanged a set is delivered to the connecting line agent with the cars. Thus the interchange report is kept up from hour to hour, ready to mail at a moment's notice, and is actually mailed to the car accountant's office at Chicago on some through fast passenger train that will arrive at Chicago the following morning. Generally speaking, this provides for closing interchange forms at 6 p. m. at points 500 miles distant.

On receipt, these narrow interchange forms are cut up, assorted, and entered by 10 a. m. the following day, and thus the information up to between 5 and 6 p. m. of the previous day is available for use on tracers and on telephone inquiries.

In the city of Chicago these interchange forms are delivered by messenger every two hours, and this information of receipt or delivery of cars in that terminal is available the same day the interchange is made, on a portion of the business. In the event there are any errors discovered on the broad sheet, after it is checked by receiving agent, a correction form is attached and one copy sent to each car accountant. In general practice it has been found, on the Chicago & North Western, that these corrections will average 25 per day, and the extra labor involved in making corrections on 25 cars is a very small item as compared with the marked advantage obtained in getting prompt information. The net result is a better satisfied public, and a large decrease in telegrams and work in yards.

On the received side of the interchange, where no exchange of narrow sheets is made, agents transcribe the information onto a narrow sheet, stamping up the name of the line received from, date, etc.

The interchange slips for each car, after being cut from the narrow copy and having served the purpose of a quick record, are attached to a card and mailed to the owning road, instead of being again transcribed on a junction card.

CANADIAN PACIFIC RATES.

Sir Thomas Shaughnessy has given out a statement in part as follows: "Most people forget that the cash subsidies, large amounts received from the sales of land and the proceeds of land-grant bonds, all of which were applied to the construction and equipment of the railway, play no part whatever in the accounts of the company [Canadian Pacific], the cost of the property having been reduced by these amounts years ago. The land grant has proved to be a most valuable asset; but if we go back to 1888 we find that $15,000,000 of land-grant bonds secured by the entire land-grant of the company and fortified by a Dominion Government guarantee of interest only realized about 90 in the market. This would represent an average price of about 80 cents an acre, so that 24 years ago this was the valuation put upon the lands by the investing public. In 1901 the average selling price of the lands was a shade over $3 an acre. It was only after 1902 that the efforts of the company to attract attention and bring people to the country commenced to bear fruit and the land-grant became an important feature.

"I notice that frequent reference is made to what is known as the 10 per cent. clause in the company's contract with the Dominion Government. Briefly stated, the contract provided that the company's rates for traffic should not be subject to parliamentary supervision until such time as the company was earning 10 per cent. per annum on the capital actually invested in the work. Dividends played no part. It made no difference whether the company was paying 20 per cent. or no dividend at all. The determining factor was the earnings resulting from the operation of the railway. For a long time we have not pleaded that we were not earning 10 per cent. Our rates and tolls have been submitted to the Railway Commission and are dealt with in exactly the same way as those of any other railway company, so that the 10 per cent. clause, as it is called, has been a dead issue for a considerable period. The subject of rates is now before the commission, and, therefore, I do not think it proper to enlarge upon the subject; but it may be taken for granted that, whatever the decision of the commission may be, the 10 per cent. clause will not be a factor directly or indirectly.

"Now, any person who knows about the expenditures that are forced upon us year by year to provide additional facilities, apart from the new railway mileage, can understand the necessity for increases in capital account. In the ten years ending June 30, 1912, the company expended in Western Canada for increased terminals, yards, sidings, track and other facilities, $75,000,000, and in Eastern Canada nearly $44,000,000, and additional cars and locomotives cost in that same period over $81,000,000; so that we have here an expenditure of $200,000,000 that had to come from the proceeds of sales of common and preference stock and from surplus earnings."

Maintenance of Way Section.

THE fact that three fatal wrecks have occurred within the past month, caused by trains running into washouts, indicates the necessity of careful operation immediately following heavy storms. While the despatchers may have been at fault in permitting the trains to proceed without knowing that the tracks were safe, the indications are that only a very hasty patrol of the track, or none at all, had been made in each of these cases. An unpleasant but very important part of a section foreman's duty is to go over the entire length of his section, day or night, immediately after a heavy storm and examine carefully all bridges and other places where the track might be weakened by a storm. As many roads require that trains wait until the section foremen report the track safe, these inspections must be made as quickly as possible, consistent with thoroughness, and in this work motor cars are a great aid. In such cases a great deal depends on the judgment and care exercised by the foremen and the roadmaster can well afford to impress this fact on his men.

IN the contest on "Tools" 19 entries were received, of which 15 have been accepted for publication. The judges, L. G. Curtis, engineer maintenance of way, Baltimore & Ohio Chicago Terminal; J. S. Robinson, division engineer, Chicago & North Western, and F. M. Graham, division engineer, Pennsylvania Lines West, awarded the first prize to J. D. Archibald, assistant supervisor, Pennsylvania, Baltimore, Md., for a description of a center punch for use in drilling rails and the second prize to F. W. Fuller, roadmaster, Northern Pacific, Dilworth, Minn., for a description of combination tools for track walkers. Other articles which have been accepted for publication were submitted by S. K. Stanisbury, Lake Erie & Western, Tipton, Ind.; D. B. Johnston, division engineer, Pennsylvania, Louisville, Ky.; A. W. Galbreath, Vandalia, Terre Haute, Ind.; W. E. Davin, supervisor, Pittsburgh & Lake Erie, McKees Rocks, Pa.; S. B. Peter, roadmaster, St. Louis & San Francisco, Pittsburg, Kan.; W. K. Walker, division engineer, Missouri Pacific, Wichita, Kan.; P. H. Hamilton, St. Louis & San Francisco, Pittsburg, Kan.; L. C. Joslin, district foreman, New York, New Haven & Hartford, Boston, Mass.; G. H. Bremner, engineer, Illinois district, Chicago, Burlington & Quincy, Chicago, and H. C. Swartz, master bridges and buildings, Grand Trunk, St. Thomas, Ont.

FEW movements have spread so rapidly and widely over the railways as the "safety first" movement. Although only two years old, the safety committee plan has now been inaugurated on over 20 roads, and is applied locally on a number of other roads. While most of the attention has been devoted to the promotion of safety in the train service and mechanical departments where employment is ordinarily considered more hazardous, much can be done along this line in the maintenance of way department. The number of employees injured and killed in the maintenance department is increasing from year to year, owing partly to the increase in the number of multiple main tracks, but more to the greatly increased numbers of foreign laborers who are unfamiliar with the methods of work. Several roads have regularly organized safety committees in the maintenance department, and much good has been accomplished on other roads by individual efforts. The piling of material so as to avoid injury to employees, the careful unloading of heavy material, and the watching and continual training of the men to avoid taking chances, are some of the measures which are being adopted. To further the safety movement, and to bring out for general use ideas which have been successfully used locally, we announce a "Safety" contest in which all plans, methods and devices tending to eliminate dangerous conditions and practices and to decrease accidents to employees in the maintenance of way department, will be eligible. We will pay $25 and $15 for the two best papers submitted, and will pay our space rates for all other contributions accepted and published. All contributions should be received by the civil engineering editor of the *Railway Age Gazette,* 417 S. Dearborn street, Chicago, by October 25, in order to be considered by the judges of the contest.

THE Mexican is an interesting type of track laborer, and one with whom the average roadmaster or supervisor is unfamiliar. Five years ago his activities in this country were confined to a limited area in the southwest adjacent to El Paso and the Mexican border. Within the past three or four years Mexicans have been in such demand and have come into this country in such numbers that they are now the main source of supply for the roads west and south of Kansas City, and are found in large numbers in Missouri, Iowa and Illinois. During the past year, when immigration from Mexico has been restricted by the unsettled conditions there, the "hombre" has not been as plentiful in the United States as last year, to the serious disadvantage of those roads that have come to depend upon him for track work. Indications are that when the conditions again become normal in Mexico, large numbers of men will come to this country and the sphere of their activities will enlarge until they will compete with the Italian throughout the middle west, if not the entire country. The Mexican possesses a number of characteristics which tend to make him a good track man, comparing him with other track men as we find them today. He often prefers section work to extra gang work, because he wishes to bring his family with him; differing in this way from the Italian who seldoms prefers section work. He is peaceable and quiet about the camp, and causes little complaint from neighboring residents. As remarked by Mr. Mathews in his discussion elsewhere in this issue, the Mexican is very loyal to the foreman who commands his respect. This was shown by the way the Mexican gangs worked during the unusually severe snow blockades on the Santa Fe and other western lines last winter. Although unaccustomed to cold and snow, they labored more faithfully than many native gangs in opening the lines, frequently remaining on duty more than 24 consecutive hours in extremely severe weather. Another point brought out in the papers which is a sad reflection on our American influence is the fact that the first year's work of the Mexican is his best, and that as he becomes Americanized his efficiency and loyalty decrease.

AT this season the maintenance forces should be completing rail relaying, ballasting and other heavy work and beginning to prepare the tracks and bridges for winter; but probably more work of the former kind now remains to be done than has been the case for several years. This backward condition is due to a number of causes, the most prominent of which are the unusual shortage of labor and the large amount of construction and repair work under way. The labor situation has been more tense this year than in any season since 1906. The railways are not the only ones that have been suffering from a shortage of men, as contractors engaged in construction work have been unable to secure full forces and in several instances important construction work has been seriously delayed, or even suspended. This shortage of labor has seriously affected not only the eastern railways, which have had to compete for labor with the manufacturing industries, but also western lines on account of the demand for men in the grain fields. In some instances even the ordinary renewals of ties and rail have been seriously hindered. At least one prominent road was unable to begin to resurface a large part of its track until July 1. Accounting partially for this shortage of labor, and adding to its seriousness, is the fact that at no time since the panic of 1907 has there been as much new work under way as is being done now. Many roads have inaugurated extensive programmes of improvements and are trying to increase their facilities

as rapidly as possible in order to properly handle the heavy business which is in prospect for this fall and winter. The present situation calls attention to the penalty attached to starting work late in the season, for while it is probably true that the maintenance work was held up less this year than usual to await the new fiscal year, nevertheless, in most cases, full advantage was not taken of the early part of the season. With the experience of last winter still fresh in his mind, the progressive maintenance man will bend all efforts towards getting his work shaped to withstand the winter season.

ONE of the best reports presented at the Roadmasters' convention last week was that on foreign labor which is published in this issue. In preparing this report the chairman took the position that little relief can be expected from an increase in wages and that we must take the labor we have and alter our system of handling it to secure the best results possible. In the discussion which followed, a number of men returned to the statement that the problem was simply a question of wages and that when railways pay higher wages they will secure the men now employed by contractors, cities, etc. In taking this position they lost sight of the fact that when the railways, which require such a large amount of labor, raise their wages, the smaller industries will be forced to do likewise and the situation will remain unchanged. The smaller industries can then raise the cost of their products to offset the increased cost of labor while the railways cannot increase the cost of their product—transportation—without the approval of the various commissions, which approval past experience has shown to be almost impossible to secure. Under these conditions the railways are not warranted in paying above the prevailing market price for their unskilled track labor. This does not refer to the wages for foremen—an entirely different matter. Experience has proved that railways can secure laborers at less than contractors have to pay, as the transportation, bunk cars, etc., are all elements of value which are considered by the men. If the railways will see that the men are given clean, freshly painted cars to live in and that abuses and overcharges by labor agents and commissaries are eliminated, the number of men who will return year after year will be greatly increased. Many roadmasters pay little, if any, attention to the living conditions furnished the men with the result that frequently almost uninhabitable quarters are provided. It is then no surprise that only the poorest men stay. On those roads or subdivisions where attention is given to these details and where the roadmaster sees that his men are not overcharged by the commissaries, one sees men returning year after year, indicating that the wage is not the only consideration. Likewise, the steady employment throughout the year will hold men. Few men of any nationality desire work for only a few months of the year and it is natural to expect that they turn to other lines of work where employment is more regular. Many roads have no difficulty in holding the men who are retained through the winter from year to year. The difficulty comes with the summer men. By a more careful study of the organization of a season's work, ways can frequently be found to profitably retain a larger proportion of the summer section forces throughout the entire year.

FROG AND SWITCH SHOPS.

THE extent to which a railway should enter into the manufacture of the materials used in its operation is a question of much interest and importance. Several roads have fully equipped plants for the manufacture of their own frog and switch material. On a majority the practice is to fix standards, to invite bids based on them and to buy in open market.

One of the most important objects of a railway in making its own material is economy, and at first glance it would appear that this could be attained, as the railway can save the manufacturer's profit and the cost of selling. On the other hand, the railway's frog and switch shop is only a minor part of its plant and receives comparatively little attention and supervision, while the manufacturer is vitally concerned in the development and efficiency of his shop. The necessary size of the railway organization makes the operation of any one detail cumbersome. Furthermore, a railway does not have to meet competition in its manufacturing operations as a private manufacturer does and does not constantly feel the necessity of keeping its cost of production at a minimum. It is, therefore, not generally found that the same degree of efficiency is attained in a railway shop as in a private plant.

In making comparisons of the costs of manufacture in railway and other shops, the cost figures must be carefully analyzed before any definite conclusions can be drawn. Too frequently indirect costs of railway operation are unintentionally omitted which the manufacturer must consider. In some instances the costs of the land occupied by the shops and of repairs to the buildings, interest on the investment in buildings and tools, accident insurance, taxes, etc., are not included in the cost of the railway's product, and it is many times very difficult to ascertain what these costs are. In fact, frequently little in addition to the cost of the labor and material actually entering into the frog is charged against it. In some cases, however, the railways appear to be making the material for less than the prices the manufacturers quote. It is necessary for the manufacturer to reduce his selling price or lose the business, and it is doubtless true that the presence of the railways in this field exerts a wholesome influence, from their standpoint, on prices.

Sometimes a very important advantage gained by a railway in making its own material is that it is thereby enabled to better regulate the delivery to meet its needs. When business is dull little difficulty is experienced in securing deliveries from the manufacturers whenever desired, but when their plants are crowded with orders the situation is different. The demands of a road can frequently be more accurately anticipated by its own shops. The Chicago, Milwaukee & St. Paul found this an important advantage when building its Puget Sound extension in 1906 and 1907. The establishing of fewer standards will usually result when a company does its own work, for it will then better realize the waste caused by maintaining varying standards. If a railway will establish a set of standards and require manufacturers to make their bids accordingly, the advantage due to the smaller number of standards will be realized.

Many question the wisdom of a railway competing with manufacturers who are perhaps its patrons as shippers. The diversity of things to be done in the operation of a railway, and the difficulty of exercising proper supervision over it are so great that it is questionable if it is wise to unnecessarily increase them. The demands of the individual railway fluctuate more widely than do those of the railways as a whole; consequently it is more difficult for a road to maintain an efficient organization than for the manufacturer who is supplying the needs of many roads, and who may make good a reduction in orders from one road by an increase in orders from another. Also, with the close relation that expenditures now bear to earnings on most railways, it is very probable that the expenditures in a frog and switch shop will fluctuate with earnings in general, as they do in the mechanical department and on the track, which will tend to increase the cost of production.

The repair of frog and switch material presents an entirely different problem, and many railways that are disinclined to engage in manufacturing have fully equipped shops for making repairs. In many cases the cost of transportation to and from a manufacturer's plant makes repair at such shops uneconomical. On some roads the regular repairs are made by the mechanical department at the nearest division shops. On others they are made at certain selected shops where mechanics are employed under the maintenance of way department and devote their entire time to such work. On still other roads the plan is being tried of providing a blacksmith car which travels over the division and makes all ordinary repairs. The prompt repair of parts is important, as it expedites their return to service and reduces the amount of stock it is necessary to carry.

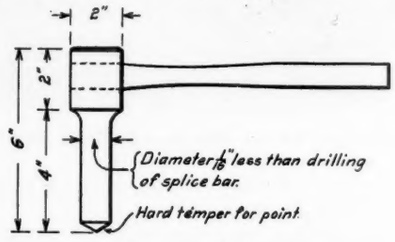
NEW OR IMPROVED MAINTENANCE TOOLS.

Contributions Which Were Entered in the Prize Contest for Devices of Advantage in Some Branch of Maintenance Work.

FIRST PRIZE—A CENTER PUNCH HAMMER.

BY JAMES D. ARCHIBALD,
Assistant Supervisor, Pennsylvania, Baltimore, Md.

In connection with the track work on a large terminal division where frogs and switches form a large proportion of the track structure, it is necessary to cut a large amount of rail. This in turn requires considerable redrilling of the rail for splice bolts. In watching track men drilling these holes one frequently notices that when the drill bit is pushed through the holes in the splice bar and turned against the web of the rail it will jump about instead of starting to cut. Having noticed that a small center punch is frequently used in machine shops where material is to be drilled, I recently had a center punch hammer made, as shown in accompanying sketch, and turned it over to one of our foremen for trial. He picked out two good laborers and started them drilling 1 1/16 in. diameter holes in new 100 lb. Bessemer rail. The first drill bit used had not been freshly sharpened, but had been used previously. However, with the aid of the center punch hammer the men were able to drill 18 holes before the bit required grinding. The next bit was freshly sharpened and the men drilled 22 holes with the aid of the hammer. Previously they had been able to drill only 10 holes before the bit required resharpening.



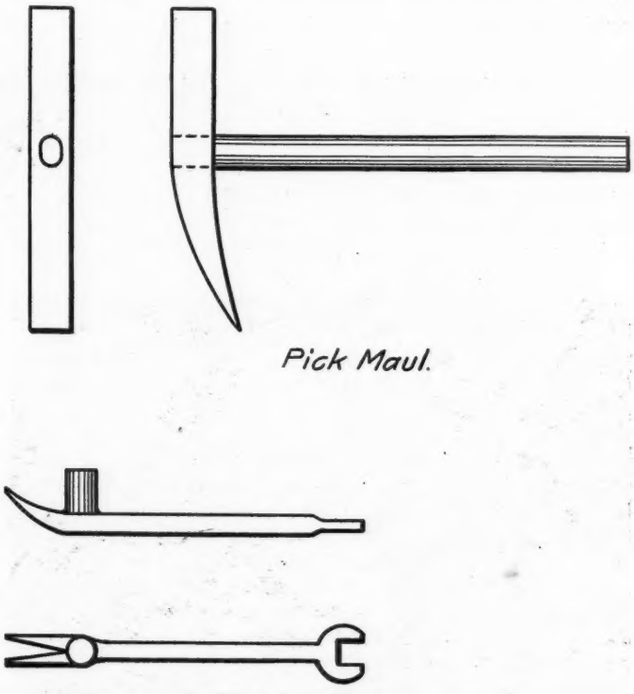
A Center Punch Hammer.

Although this has been in use but a short time it gives promise of excellent results not only in increasing the duty secured from the drill bits, but also by decreasing the number of bits broken and saving the time of the men returning to the tool houses to regrind the bits.

SECOND PRIZE—COMBINED PICK AND MAUL; ALSO A WRENCH AND WIRE STRETCHER.

BY F. W. FULLER,
Roadmaster, Northern Pacific, Dilworth, Minn.

It usually falls to the lot of the track walker to repair fences as well as to patrol the track, and it is very difficult for the men to carry sufficient tools to do this work. A man needs a pick, spike maul, wire stretcher, hammer, wrench and staple puller, but to carry these would require two men. To remedy this condition I devised two tools which would serve the purpose of the six. A blacksmith took an old spike maul, sharpened one end and curved it slightly to form a very good broad ended clay pick, the other end still being used as a spike maul. The blacksmith then took an 18 in. piece of ¾ in. steel and formed a wrench head on one end, which would fit the standard track nuts. On the opposite end a claw was made similar to that on an ordinary carpenter's hammer, but extending straight out instead of at right angles. Each prong was made the right size to fit into a common fence staple, enabling the staple to be easily drawn by giving the wrench a slight turn around the post. These claws were crotched close together in the bend and by catching the wire in this crotch and using the wrench end of the maul as a handle with the post as a fulcrum, the wire can be pulled snug and tacked with the spike maul. As it was necessary to provide a hammer for repairs to gates, board fences, etc., a hammer head was added to this tool two inches from the claw on the inside of the curve. In this way, two tools did the work of the six ordinarily required. I have frequently seen men even pull loose spikes with the claw end of the wrench tool, using the pick maul to secure a "bite."

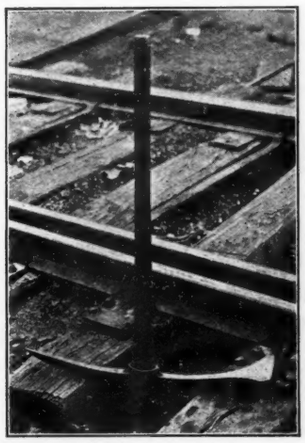


Combination Tools for Track Walker.

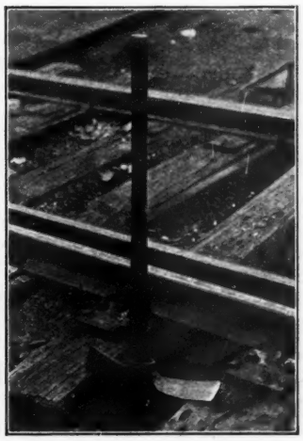
A COMBINATION PICK AND ADZ.

BY P. H. HAMILTON,
St. Louis & San Francisco, Pittsburg, Kan.

The accompanying photograph shows a combination pick and adz made from an ordinary tamping pick. The tamping end of the pick is heated, drawn out and hammered down thin, and



Combination Pick and Adz.



Mattox for Yard Work.

is then tempered to provide a good cutting edge. This has been found superior to the common track adz for working around switches and under frogs where it is necessary to reach some distance under the rails. It also possesses an advantage over the common adz on account of its strength and weight, which enable the track men to go through knots and into hard timber where there is heavy adzing to be done. The tool is readily sharpened on a grindstone and will hold a good cutting edge.

The mattox, also shown in one of the illustrations, is used around the yard in place of the adz, where it is necessary to do considerable work on crossing planks, etc.

A GASOLENE BLOW-TORCH IN TRACK WORK.

BY S. B. PETER,
Roadmaster, St. Louis & San Francisco, Pittsburg, Kan.

The following description and photographs illustrated a few of the many uses to which a gasolene torch may be applied to track repairs. Fig. 1 shows the method of making repairs to a switch point which has become so badly worn that a wheel with

Fig. 1—Bending in a Worn Switch Point with the Aid of a Blow-Torch.

a sharp flange is liable to split the switch. The lighted torch is placed in a position to heat the switch point at the place where it is desired to bend it, care being taken to heat the base of the point. While this is getting hot, one or two spikes are driven in the head-block as shown in the picture and a track jack placed in the position shown. A block of wood or iron is placed between the point and stock rail where it is to be bent. By tightening the jack the end of the point may be bent after being heated so that the worn part will be hidden under the stock rail when the switch is thrown to this side. In this way the switch will be made as safe as a new point with no delay to traffic and a trifling cost for labor. This operation can be performed by one man in from 20 to 30 minutes.

The second picture illustrates the manner in which a bent point may be straightened in a few minutes without removing the point from the track or running any risk of breaking it in attempting to straighten it without heating. Very frequently in large yards, points are twisted by engines running through the switches. In such cases it is only necessary to heat the point at the place where it is twisted when it may be easily bent back to its former shape. This can be easily done by using a claw-bar set with the claws astride of the point a short distance from the place to be bent.

The third photograph illustrates the manner in which repairs are made to a switch-stand where the crank-shaft has been twisted so that the stand has insufficient throw. This same operation is sometimes performed without heating the shaft, but this has a tendency to weaken it, and also requires the efforts of

Fig. 2—Bending a Switch Which Has Been Run Through.

three or four men on the bar. When the shaft is heated it is easy to give it the exact throw desired.

The torch can be used very profitably in heating rails to be kinked for stock rails, in heating rivets in place so they may

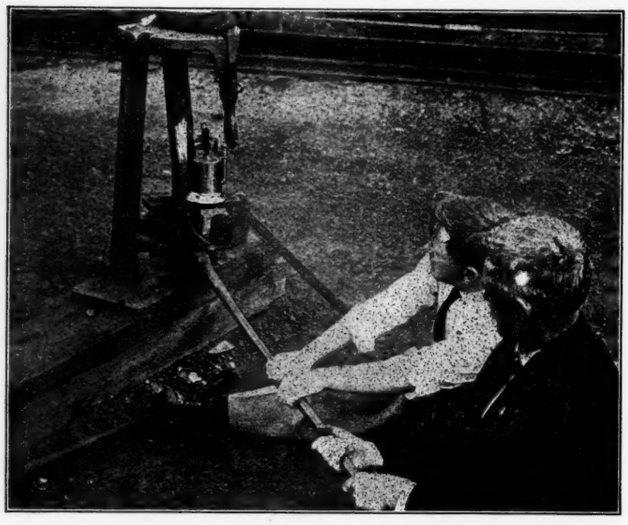


Fig. 3—Bending a Crank Shaft of a Switch Stand with the Aid of a Blow-Torch.

be tightened, for melting ice around frogs and switches, etc. In fact, the live foreman will find many cases for the torch when it is once brought to his attention.

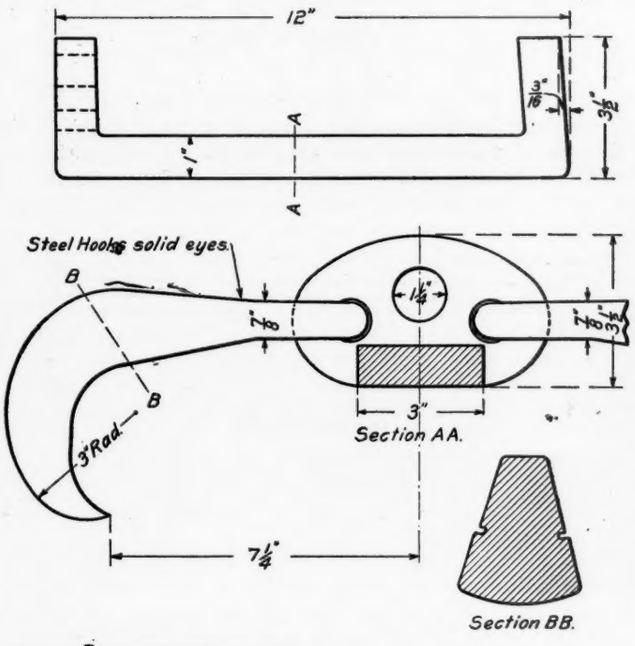
A DEVICE FOR LINING STRINGERS.

BY W. K. WALKER,
Division Engineer, Missouri Pacific, Wichita, Kan.

The usual method employed when lining stringers on wooden bridges is to drive spikes in the top of the caps to provide a footing for the jack. This is very undesirable for several reasons, one of which is that it is an unnecessary waste of spikes in case they are left in the cap. If these spikes are pulled out they leave holes in the top of the caps, where decay soon starts, thereby lessening their life.

A device is in use on this division which eliminates the driv-

ing of spikes in the top of caps for a jack footing. It is composed of a set of two hooks, the fixed ends of which work in a central block. This block has an oblong piece of steel fastened to it at right angles to the hooks. The foot of the jack is placed against this piece of steel for the packing of stringers, the hooks having been hooked over the edge of the caps. The entire hook



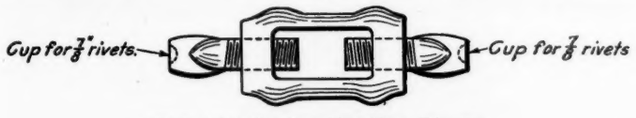
A Jack Footing for Lining Stringers.

is made of steel and can be readily made at any blacksmith shop at a cost of approximately $3.25 each. Two of these devices are furnished each bridge gang. This device is very handy and is a time saver, as well as preventing the spiking of bridge caps.

DOLLY BLOCKS FOR HEADING RIVETS.

BY D. B. JOHNSON,
Division Engineer, Pennsylvania Lines, Louisville, Ky.

The accompanying sketch shows a dolly block which has been used by riveting gangs on the Louisville division of the Pennsylvania Lines for several years with good results. It is made



Dolly Blocks for Heading Rivets.

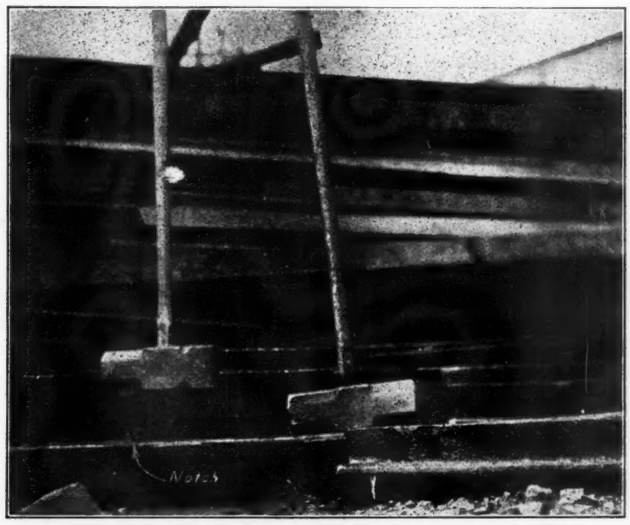
by cutting off, upsetting and shaping the ends of the adjoining rods of a turn-buckle secured from bridge counter-ties. This device takes the place of the sledge hammer ordinarily used when working in close places.

A SLEDGE FOR CUTTING RAIL.

BY G. H. BREMNER,
Engineer Illinois District, Chicago, Burlington & Quincy, Chicago.

I would suggest for consideration, the use of a sledge for cutting rail. This can hardly be considered a new thing, but it is not of general application. The rail is first laid on its side and a notch is cut about a quarter of an inch deep directly into the base with a chisel, usually requiring two blows with a 30-lb. sledge hammer. The rail is then turned over on the opposite side and one or two blows struck on the base directly opposite the notch. This cracks the base slightly. The rail is then turned on its base, supported at both ends and struck one or two blows on the ball, which completes the job, the rail breaking in a square cut.

The work can be done by two men in much less time than is required with the usual method of cutting with a chisel, raising the rail and letting it fall across another rail. It does a clean job, frequently as good as if it were sawed, and much



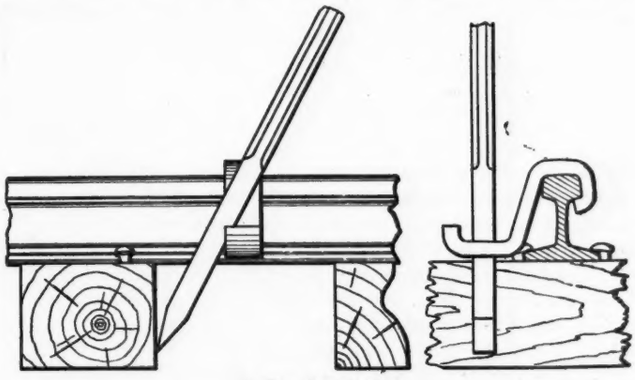
Rail with Base Notched Ready to Break.

better than with the ordinary method of cutting with a chisel. The hammer used is a thirty pound sledge, and requires a strong man to use it. The picture shows the sledge and also how the notch is cut with the chisel. The method is very simple.

A CONVENIENT TOOL FOR SPACING TIES.

BY A. W. GALBREATH,
Vandalia, Terre Haute, Ind.

Most roads require that the ties be respaced when new rail is being laid, so that the joints will either be suspended or supported in accordance with the standards. At such times a short piece of wrought iron, 1 in. x 2½ in., bent in the general shape of the letter "S," as shown in the illustration, makes a very



A Tie Spreader.

convenient tool for spacing ties. The use of this device not only reduces the expense of spacing, but also avoids the renewal of a large number of partially worn out ties which would be destroyed if they were driven to position with a spike maul in the usual manner.

The lower hook is used as the fulcrum for a lining bar which

is the only other tool needed, after the ballast has been stripped to the bottom of the ties. The pressure on the lower hook causes the upper hook to bind on the ball of the rail. The upper hook does not need to conform very closely to the rail; in fact, it should be loose enough to be readily placed and removed. Being larger than the head of the rail will not affect its grip on the rail when in use.

With this device as a fulcrum, a claw bar can be conveniently used for holding ties when spiking. However, the writer is of the opinion that a short 6-in. x 8-in. block at the end of the tie for a fulcrum, with a lining or pinch bar as a lever, is more convenient for holding ties when spiking.

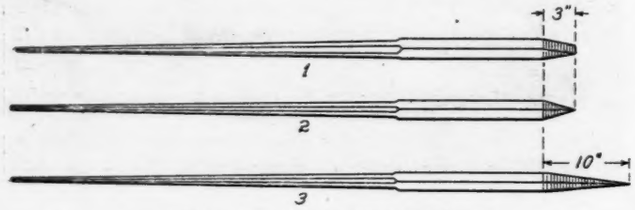
The tie spacer described above was introduced on the St. Louis division of the Vandalia by W. H. Byrkit, supervisor, at Brazil, Ind.

A SHARP-POINTED LINING BAR.

BY W. E. DAVIN,

Supervisor, Pittsburgh & Lake Erie, McKees Rocks, Pa.

The lining bars furnished by tool manufacturers usually have short blunt points as shown in Figs. 1 and 2. These types of points are very hard to get into the ballast and under the rail



Different Types of Lining Bars.

where stone ballast or other hard ballast is used and where the track is filled in with ballast to the base of the rail.

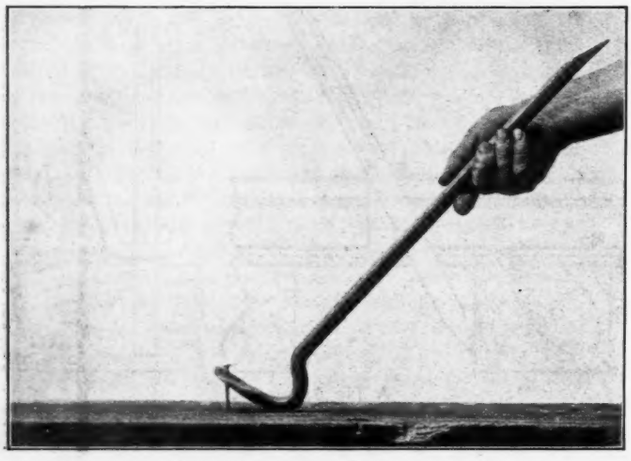
Fig. 3 shows a special drawn out long diamond point lining bar that is very easy to get into any kind of ballast with very little effort, and which has been used on the Pittsburgh & Lake Erie with very satisfactory results.

A NAIL PULLER.

BY S. K. STANSBURY,

Lake Erie & Western, Tipton, Ind.

The nail puller illustrated in the accompanying photograph was first designed on this road several years ago, and is now



A Nail Puller.

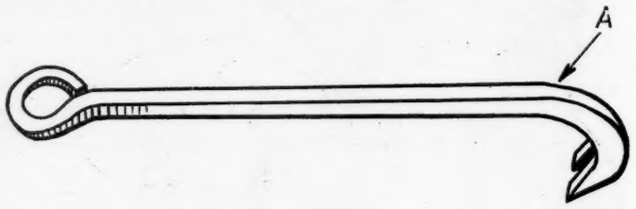
being generally adopted in all the bridge, carpenter and concrete gangs, where it has been found especially convenient. It is made in three sizes. For heavy work we use 1 in. octagon tool steel 36 in. long; for medium work 7/8-in. octagon steel 30 in. long, and for light work 3/4-in. octagon steel 24 in. long. This is bent in convenient shape for drawing nails on one end and sharpened on the opposite end to provide a convenient pinch bar. While simple in itself, this device has proved very convenient and a practical aid in lumber work.

A FENCE HOOK.

BY P. H. HAMILTON,

St. Louis & San Francisco, Pittsburg, Kan.

The fence hook shown in the accompanying sketch is made from an old track wrench, the jaws of which have been broken off. The heavy end is made into a claw and bent as shown,



A Fence Hook.

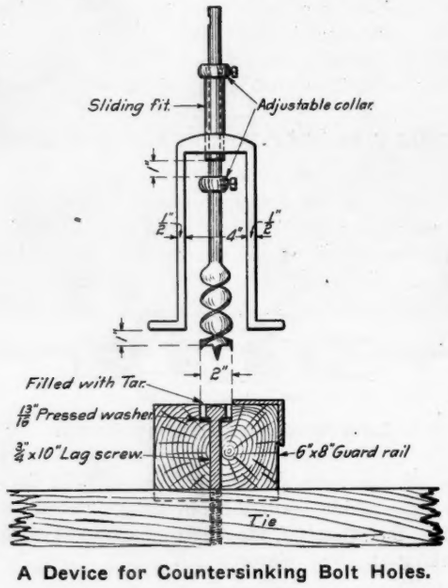
and is used for tightening fence wire and pulling staples and nails. To stretch a wire a man will catch the claw over a barb at a post, and using the post as a fulcrum with contact at the point marked A, will be able to stretch the wire for several hundred feet.

A DEVICE FOR COUNTERSINKING BOLTS OR LAG SCREWS.

BY L. C. JOSLIN,

District Foreman, New York, New Haven & Hartford, Boston, Mass.

The device shown in the accompanying sketch is of assistance in boring wooden guard rails to a uniform depth for countersinking bolts or lag screws. It consists of a vertical frame



A Device for Countersinking Bolt Holes.

through which passes an auger. The depth to which the hole can be sunk is regulated by the two collars, which can be adjusted for any depth desired.

Wages of Track Repair Laborers Raised.—The Grand Trunk Pacific Railway has advanced the wages of its track repair laborers to a minimum basis of $2 a day, and the foremen to a minimum of $79 a month.

CONSOLIDATION OF MAINTENANCE FORCES.

BY G. H. BREMNER,
District Engineer, Chicago, Burlington & Quincy, Chicago.

We live in a day of progress and great advancement, and especially have there been great changes and achievements in the transportation industry in recent years. All departments of railway transportation have seen improvements, modifications and advancement in methods and economy of performing work. This is markedly so in the handling of freight and getting trains over the road. This has been done by the consolidation of various units of work or by the enlargement of these units, so that unnecessary labor has been saved. One man handles larger engines, pulling bigger trains and carrying many times the amount of freight formerly carried; one officer supervises many more subordinate officers and governs more departments of work than formerly, and through the consolidation and unification of the departments of the road the work has been systematized so that it is performed as easily, more systematically and much more economically than in the past.

In spite of these object lessons one branch of railway work has not been affected by these changes which have occurred in the auditing, freight, passenger, real estate, operating and other departments. This is the maintenance of way department.

On every railway in the country we still have section gangs of a few men each under section foremen who take care of a few miles of track; we have bridge gangs of a few men who look after the bridges in certain territory; similarly we have the water service gangs, building gangs, signal gangs, telegraph gangs, and engineering gangs, all of whom go over the same territory, each gang having its individual foreman and each class reporting to an independent head on the division.

The question of whether it is possible or not to improve upon these methods of maintaining tracks, buildings, bridges, water stations, fences, signals and telegraph lines does not seem to have been considered. It probably is rank heresy to suggest that there could possibly be an improvement by a consolidation of the various kinds of labor under one foreman, although various and possibly more diversified interests have been consolidated in other fields of railway work. Yet, considering the fact that we are not able to get good men and are today working poorer men in these various gangs than we have in the past, and also that it is necessary to keep up better track and to do more track work of every kind to handle the larger engines and equipment, it is a fair suggestion that we stop and consider for a moment whether the present method can be improved in such a manner that we can get a better grade of men and handle the work more efficiently and economically than we have been doing in the past.

For these reasons let us consider what the result would be if all the maintenance gangs were consolidated into one department and all classes of work on a certain territory were cared for by a single gang. The foreman of each gang would need to be a man of ordinary intelligence and judgment who could tamp and line track, make ordinary repairs to a bridge and water station, repair signals and splice telegraph wires that have been broken, and supervise all the manifold duties which are now being handled by the many and various foremen and gangs. He would not need to be personally a specialist in each of these lines, but should have men with him capable of caring for the details of each line of work, and should be a man of force and common sense capable of handling men.

While the present day section man knows little about bridges, he could easily be taught how to do the usual repair work and with a good bridge man in the gang he should be able to care for all the ordinary bridge work; likewise the usual small repairs to pipes and pumps could be taken care of after a short period of education; the signal and telegraph work could also be taken care of by the same men with competent teaching with the aid of one or more men in the gang who are already familiar with that line of work.

It would not seem advisable to consider handling the unusual and larger jobs in this way. When they are large enough to require a number of men for long periods of time it will probably always be best to handle them with special gangs or extra gangs as they are called. However, the ordinary every-day maintenance work of various classes could all be handled by one gang with competent men and foreman.

In this way there would be a great reduction in the number of foremen needed to handle gangs. A vital question today is how to get good foremen in any line of work. This plan would simplify the problem by reducing the number of foremen needed and giving a wider field to choose them from. All the foremen need not necessarily come from the track department nor from any one department, as the bridge department, the water service, the signal, telegraph and engineering departments, would each be considered and the best all-round men from each of these departments would be made foremen. Where the section had many bridges a bridge man should be chosen foreman, where the interlocking was extensive a signal man should be selected. Local conditions and the character of the men should govern. Also, the size of each gang could be increased from the number now in any one gang. This would allow more men to handle heavy timbers or rail and to assist in any work which may arise in an emergency. Where possible each gang should have a competent bridge man, a competent track man, a competent man to handle water service, building and line work, and each of these specialists should have more or less experience along their line of work, while the foreman should be an all-round foreman, capable of getting work done.

The men for each of the various departments are now recruited from practically the same class of labor and are all of about the same scale of intelligence. By combining forces the quality of men should be bettered as there would be a better chance to select and give the native American and other good men more permanent work throughout the winter season. The savings by this method of combining the forces would be various.

First, fewer men would be needed. The section gang probably now loses ten per cent. of its time going over the road to and from work. The bridge gangs lose a much larger proportion, possibly 40 or 50 per cent., while the water service, signal, telegraph and engineering departments probably lose 50 per cent. of their working time getting to and from their work. It is not unusual for special men to spend many hours or a whole day riding back and forth to do a few minutes' work, such as to nail down a few planks in a platform, make a few repairs around a depot, screw up a few nuts on a pumping plant, splice a broken wire, measure up a few buildings and numerous other small things that are necessary to be done, which now cost excessively.

Then, when there is work to be done in which two departments are interested there is always a loss on account of each waiting on the other. In ballasting or raising track a bridge gang is needed to raise the bridges, their time being mostly spent waiting for the track men, or else the track men are delayed waiting for the bridge gang. Likewise, in relaying rail where it is necessary to bond the rails there are similar delays between the signal and track gangs. The same difficulty arises in any joint work, all of which would be avoided by a consolidation of the various kinds of work in one gang.

By consolidation the whole proportion of time lost should be reduced to the ten per cent. of the section gang and even less than that, as with a larger gang work can be so arranged that less time is lost in proportion to the total time of labor, as a few men can be making the inspection trips while the remainder are at work. Also as the laborers would be of a better quality the number would be less for any given amount of work.

Second, the work could be more promptly performed as the men would be on the ground and as "a stitch in time saves nine" it would be taken care of more economically and with a greater regard for safety.

Third, the work would be more thoroughly performed. It

would all be done by the men who had to care for it every day and who would have a greater personal interest in having it done right. We could well afford to get better men as better wages could be paid and still save money on the payroll, for fewer men would be needed.

"Better" does not mean that we would have any aristocrats in these gangs. Every man should be competent to handle the hammer, axe, tamping bar or shovel, or do whatever work may be needed, and we need not anticipate any trouble in this direction with a competent foreman.

Any change in the character of handling the work by consolidation would make necessary a somewhat different organization on each division. There could still be a man whose duty it was to care for the track, one to care for the bridges, another for the signals, another for the water service and another for the buildings, each of these men reporting to a central head. Today this central head is in most cases the superintendent. However, in order to more efficiently consolidate and distribute the work so that proper attention be given to each class of work it would be necessary for someone to be in authority who could give his entire time to looking after the maintenance work on each division who might be an assistant to the division superintendent or an assistant to the engineer of maintenance of way, according to the organization of the road. This is already done on some roads at the present time, so that it would not be an experiment. This consolidation need not be limited to the departments mentioned, but might include in it also the engineering department; that is, in every gang there could be a man who had had more or less education and experience as an engineer, who could give lines and levels for track work, stake out switches, and do light engineering work, also looking after time, helping the foreman keep track of his reports, checking material, making out requisitions and statements, and doing other work along these lines requiring an education.

As a possible example of how this would work out, on a division of a certain road during the month of May, 1912, there were employed 101 section gangs having a total of 106 foremen and 578 men, or an average of 5.7 men per gang. These gangs received wages amounting to $28,151, an average of $41.16 per man per month, or an average of $1.52 per day for each person.

There were also 16 extra gangs having 722 men, or an average of 45.1 men per gang, which, however, we will disregard as it is not the province of the present article to deal with this class of labor. It might be very pertinent, however, to inquire whether part of this labor might not have been handled to advantage with ordinary section gangs properly equipped.

There were 19 bridge, building, water service and signal foremen with a total of 297 men, or an average of 15.6 men per gang. They received $14,448, an average of $45.72 per man per month, or $1.69 per day.

On a basis of 50 per cent. efficiency for the bridge, building, water service and signal service gangs the foremen realized 256½ days labor out of 513 days time, and the men realized 4,009½ days labor out of 8,019 days time, or out of a total of 8,532 days time 4,226 days effective labor was realized.

Not including the field engineering force and extra gangs this makes for the entire maintenance force 3,375 days time and 2,832½ days effective labor for foremen, and 23,625 days time, or 18,054½ days effective labor for the men, or a total for both foremen and men of 27,000 days time, with 20.887 days effective labor. If we reorganize the force to a basis of 101 maintenance gangs, equal to the present number of section gangs, to handle the work it would require 101 foremen, which, on a basis of 90 per cent. efficiency, would realize 2,454 days labor out of 2,727 days time, while 875 men, the same number as now employed, would realize 21,262½ days labor out of 23,625 days, or a saving of 648 days time for foremen and an increase of 3,208 days effective labor from the men.

Assuming the wages of the foreman saved at $55 per month, a low rate, the total saving would amount to $1,320, while assuming the value of the additional efficiency of labor as worth $1.50 per day, which is also low, as the rate of efficient labor is from 1.11 to 2 times the time paid for, according to the assumptions we have made, the increased efficiency for the month would amount to $4,812, or a total gain of $6,132. This represents only the gain through the saving in time on account of the men being near their work and not having to travel long distances to and from it. There will be other savings in the fact that the labor will be more permanent and thus a better class of labor can be obtained.

On the other hand the saving would be lessened if an increase in rate of wages should be paid to get more efficient labor. It may not be necessary to increase wages in order to increase efficiency, but it would probably be necessary as the diversified classes of labor would require abler men. However, the saving in time would easily allow this with a reduction of cost. An increase in wages would undoubtedly result in better section men under the present organization, but in the proposed organization to get efficient foremen and to get and hold the best local labor this would likely be still more necessary. The rate need not be the same for every man in the gang, as each man should be paid according to his ability.

The percentages assumed may or may not be correct, but on any assumption that is likely to be made a large saving can be shown, and as these figures were selected after some investigation the percentages used are probably not far wrong.

These thoughts are presented for serious consideration and are subject to suggestions and modifications. The official organization described is not intended to be recommended for every road and is only suggestive of what might be done. There is undoubtedly a large field for economies in the handling of labor, and the uniting of the various maintenance forces under one leadership and under one set of foremen is sure to bring much improvement if properly done.

A STUDENT GANG.*

BY ARTHUR JUNG,
Roadmaster, Atchison, Topeka & Santa Fe, Newton, Kan.

The track department of a railway may be compared to a certain extent to our regular army. Owing to the small amount of pay that an enlisted man receives, commissioned officers can be made from the rank and file only to a small degree, but must be educated in schools for that purpose. In the track department the pay of the laborer is not enough to warrant men who have the ability to become foremen to go to work as laborers.

The following method would, I think, overcome the difficulty: Organize a gang of six or eight young men between the ages of 19 and 26, who are sound of body and mind, of good reputation and have a common school education. Provide them with a good comfortable bunk car. Put them under the charge of one of the best foremen on the district for a time and then turn them over to another foreman, equally as competent as the first. Do this with three or four of the best foremen so as to give the students the benefit of the combined experience of all. By living in the bunk cars they can easily be transferred from one point to another, or put in with extra gangs, where track laying, surfacing, reballasting and other work of that nature is being done. It will also give them an insight into the method of handling larger bodies of men. If it is decided after a sufficient time that these men will not make foremen, take them out of service and supply other men who will. These men should receive $2 per day, and be constantly employed until they are put in charge of a gang of their own. There will be no loss to the company as they can fill the places of laborers constantly, and if the companies can pay from $1.25 to $1.50 per day for foreign labor, a man of this caliber will easily be worth $2 per day.

*Received in the contest on The Section Foreman Problem, which closed March 25, 1912.

THE MEXICAN AS A TRACK LABORER.*

The Fourth of a Series of Discussions of the Characteristics of the Various Types of Maintenance Workmen.

THE MEXICAN AS A TRACK LABORER.

BY J. D. MATHEWS,
Division Engineer, Southern Pacific, Tucson, Ariz.

In presenting this article it is appreciated that the views expressed are considerably at variance with those commonly held concerning the adaptability of the Mexican to railway work. The prevailing conception of the Mexican in this country is that he is lazy, shiftless and cruelly treacherous—a fit subject only for the sneaking villain of the moving picture screens. Practically six years' experience with the Mexicans in their own country long since demonstrated to the writer how completely erroneous and unjust is the popular opinion, as he found them to be ordinary human beings, endowed with much the same vices and virtues as others of their mold, if not of their race. The impression so commonly entertained of them as a race must have its origin in the conceit which we have regarding our own race, which leads us frequently, though often unjustly, to condemn those whose habits of thought and action differ materially from ours. Those who point to the existing unsatisfactory conditions in Mexico as indicating the unstability of the Mexican character should reflect that it is still within the memory of living men when our own nation was similarly embroiled; while the unbiased narratives, now to be had of our own conflict, reveal many situations on either side that are nothing to be proud of.

Does the Mexican readily adapt himself to track labor? Are the results from his services satisfactory to his employers? Evidently the solving of these two questions will fix the status of the Mexican as a track laborer. From our geographical position, located at the Mexican gateways, it would appear, from the excessively keen competition among the various labor agencies to secure Mexican recruits for their various clients, that both questions have already been decided in the affirmative, for not even a minimum daily rate will impel large consumers of labor to such keen competition as does exist, unless the final results are satisfactory. These facts, therefore, practically eliminate the major questions, just propounded, from the discussion, and confine us to an examination of those characteristics of the Mexican which are peculiar to him as a race and with which the foreman should be familiar to use him intelligently and get satisfactory results from his service.

The Mexican recruit has an intelligent and versatile, though unsophisticated and untutored, mentality. His rearing has been as a sort of semi-feudalized vassal, to whom his "patron" is an over-lord, requiring his services in return for protection and subsistence furnished. The employer who would successfully use the Mexican in this country must of necessity assume practically the same position as does the "patron" and provide the same necessities. Growing up under such a system, and knowing no other, has dwarfed his sense of responsibility and his ability to carry the part of an independent free agent. This must be understood and appreciated to correctly interpret his character and to intelligently remold it to meet modern conditions and methods of living, for this remolding is necessary to develop the peon into a thinking, self-reliant individual, capable of producing economic unit costs, and developing what is also important and woefully lacking—a serious appreciation of responsibility.

This lack is one of the most noticeable as well as one of the most unsatisfactory of the Mexicans' characteristics, and the reason is quite evident—neither he nor his ancestry for generations back have been permitted to assume a responsible part in the management of affairs either personal or political. His politics have been of the "hand-me-down" type for centuries, and whether they fitted him or not, he has had to wear them. His personal affairs have been handled with his technical consent by his "patron" until he has been almost absolutely eliminated from any participation in matters of administration. He does as he is told and no more, and when he is told again he does it again. He is not rebellious. He is docile and obedient, and with good treatment he is loyal to his superior, be it his foreman or "patron." The complete annihilation of his individual personality during his early training has unfitted him to make decisions and act quickly and correctly in the face of an emergency. Disappointments follow freely in the wake of the peon, if he is placed on his own responsibility during the early courses of his training, and expected to exercise his own originality and judgment. He will carry out the most exacting detail with good average satisfaction, when placed under a foreman who will require it of him. But remove the foreman and leave him to carry out the same details individually, and the result will be a disappointment. While these facts hold true of practically every peon recruit, with experience and training much of this particular instability of character, so unsatisfactory in all railroading, will disappear. "I forgot," and "I didn't think" are too much a part of his regular growth to be eliminated without much painstaking care involving a considerable period of time.

In contrast to this lack of appreciation of responsibility, his loyalty to the superior who holds his respect and esteem is seldom equalled. In case of wrecks and washouts or other emergencies, he will work as long as required if supplied with a reasonable amount of food and coffee. In this particular respect he is far more dependable than the Greek, Japanese, or any other class of foreign labor with which we have had experience. Foremen should not be allowed to take unreasonable advantage of his willingness to work as long as the emergency exists. If the emergency will probably cover a considerable period of time, boarding outfits should be placed convenient to the work and the men relayed to their meals. By doing this 48 consecutive hours can be had from them without danger of creating a crisis. However, as soon as the actual emergency ends, as for instance, when the line is reopened for traffic, he should be permitted to rest and refresh himself. Under such conditions, and under the supervision of the foreman or supervisor whom they respect, Mexicans can be relied on to remain at work without constant driving.

Other undesirable characteristics often attributed to the Mexican are treachery, stealth, drunkenness and a vicious disposition. In individuals these characteristics will be found among them as among other nations, but nothing could be farther from the truth than to say they are national traits. People who will exhibit loyalty as they will are not looking for an opportunity to stick a knife into your back. The fact that the knife is their national weapon does not make them villainous any more than does the pistol, which is the American weapon. Under normal conditions they are peaceful and not trouble breeders. Liquor, which usually emphasizes peculiar individual characteristics, usually makes them musical and inclined to merry-making. If quarreling results, it is because of the presence of the exception to the rule in whom the liquor has produced surliness, and this exceptional presence is sufficient to shift the whimsical humor from merry-making into brawling. Identify the surly individual and isolate him while in liquor, or eliminate him from the force, and little fear need be expected from their "pay-day sprees."

That the peon will indulge in his "pay-day spree" results naturally from his early training and environment, as do his other

*Three articles in the *Railway Age Gazette* of June 21, page 1568, discussed "The Hobo as a Track Laborer"; four in the issue of July 19, 1912, page 121, discussed "The Negro as a Track Laborer," and four in the issue of August 16, page 303, discussed "The Italian as a Track Laborer."

characteristics. Being raised in absolute dependence on his master, he is lacking in self-reliance and self-indulgence follows naturally. The Mexican is a grown up child, and even as a child grasps at every opportunity to indulge its senses so the grown up Mexican child throws off restraint when removed from a system that made possible few indulgencies, and provided in railway service with what to him is a magnificent wage, he revels in indulgence to surfeiting. Each pay day brings a "spree" and a semi-paralysis of work; but with the progress of time and with the senses fully sated, this indulgence loses its attractiveness to many who put the excessive license aside, and become steadier in their habits—simply the "fittest to survive" making themselves known. Those who continue the indulgence indefinitely will be cast aside by the workings of the same inevitable law.

Another very undesirable characteristic of the Mexican, and which like the others has its origin in his early environment, is a necessity for his employer to provide for his physical wants. Never having any credit at home the value of protecting his credit by making his word good and thus making his credit an asset has never appealed to him. His sense of business honor has had no opportunity for development, and he considers it nothing to his discredit to avoid the payment of his bills. He seems to feel that whoever takes the chance of crediting him should take the chance of getting his money. The immediate result is that he cannot obtain unsecured credit for any amount, and it follows that his employer must provide the means of obtaining credit if he desires to avail himself of the services of the Mexican. The final result is a protected commissary, from which the complete elimination of certain forms of "graft" is next to impossible, and which if not most carefully supervised is liable to victimize the laborer in various ways. But until the Mexican raises his standard of honesty he will have to accept protected credit with all its objectionable features. He has no more idea for providing for his necessities and future than a child. Being out of a job never faced him in his own country. On the contrary, the peonage system made it practically impossible for him to get out of a job. Realizing that his master held him in peonage by dishonest methods he naturally grew up with the feeling that such methods were correct, and that business honesty would not only not be an asset to him, but on the other hand, an actual liability.

The foreman must understand the Mexican if he would successfully profit by his use. He must expect to find him untutored and unlearned even in many of the, to us, commonly known facts. He must go into details by explanation and example, and show them just what he wants done and how it is to be done. Furthermore he cannot satisfactorily explain to them if he cannot talk to them. He should therefore have a working knowledge of their language, and this can be learned in a few weeks or months by diligent effort by the conversation method. There is little excuse for a foreman who has worked Mexicans for a year and cannot issue instructions to them in their own language. The free use of abusive profanity on the part of the foreman is a sure road to failure. The Mexican will not accept it patiently or long, for the blood of the Montezumas and the Ferdinands courses through his veins, and two prouder races never trod the face of the earth. Treat the peon well, and he is your subject and will be loyal to you to the end.

GOOD TREATMENT NECESSARY FOR MEXICANS.

BY L. J. HUGHES.

Division Engineer, Chicago, Rock Island & Pacific, Herington, Kan.

The great disadvantage in working Mexicans as track laborers is, of course, the fact that they do not understand the English language. However, in the Southwestern States where Mexican labor is used almost exclusively, the foremen are becoming familiar with enough of their language to give simple orders. Also, the Mexican is quick to learn what is meant when directed in English and little difficulty is experienced with Mexicans who have been in this country for some time. Furthermore, a foreman who wishes to secure results with a Mexican gang can, with a little patience, soon educate them to understand his orders when given in English.

The next disadvantage in working Mexicans is that the Mexican is accustomed to a semi-tropical climate and cannot stand the hard winters that are experienced in the central and northern states. Where large extra gangs of Mexicans are employed the men begin to desert in large numbers after the first frost or snowfall. The remedy for this is to so arrange the work that it will be completed by the time cold weather sets in and the extra gangs can be laid off. However, I have known Mexicans to remain on sections for two or three years during all kinds of weather, and work without complaint during the most severe storms in winter. The reason for this, however, was that the men were treated right and were handled by a foreman who knew how to get work out of his men.

The next disadvantage in using Mexican labor is that the Mexican is a temporary resident of this country. He comes to this country from El Paso or other points on the Mexican border in the spring, expecting to work for a few months and then return to his native country. If you try to keep him from getting back when he wants to return you will have a worthless laborer on your hands. The only way to get the most effective work out of a Mexican is to face this proposition squarely. The promise of a pass back to a point on the Mexican border when the work is finished will hold a gang together more effectually than any other means. But once the promise is given it must be fulfilled, or the Mexican loses faith in his employer and will never give as good service if he should be employed again.

Having enumerated the most important disadvantages, let us turn to the advantages which make the Mexican perhaps the best class of track labor of all the various classes of foreign labor. As an extra gang laborer the Mexican is not to be excelled. Where he is properly housed and working for a foreman who understands him he is happy and can be made to take an interest in his work. The Mexican is not clannish, and has no gang leader to dictate to him how he shall work or what he shall require of his employer. Each Mexican is his own boss and no interpreter is required to transmit to him the orders of the foreman. The interpreter in a foreign extra gang is regarded by all roadmasters as a trouble maker, and many roadmasters can tell of whole gangs of Greeks or Italians deserting their work in a body at a critical moment simply on account of some dispute between the interpreter and the foreman. This is fortunately not so with the Mexican. The foreman can weed out his gang and discharge the incompetent without any protest on the part of the rest of the gang. No one Mexican can stir the whole gang up to mutiny, because the Mexican is not by nature clannish.

One of the first things for a foreman to learn in handling Mexicans is that he cannot drive them. A Mexican will not resist by any noticeable action harshness on the part of the foreman, but he will not give that foreman the work that he should. The Mexican will stand more abuse than any other class of laborer, and many ignorant foremen think that they are handling a gang of Mexicans effectively by asserting authority and shouting orders accompanied by a stream of strong language. However, it will be noticed that such a foreman is getting no work from his gang and the men will "soldier" as much as possible. A foreman should, of course, be firm with his men, not hesitating to discharge any not doing his work, but if he will treat his Mexicans as human beings and see that they get a "square deal," they will soon have confidence in him and will work for him long and faithfully.

The Mexican is a great spender, and is happy whenever he has a chance to buy something. For this reason a good commissary honestly conducted where the men can buy the foods which they are accustomed to in their native country and articles of clothing, at a fair price, will be a great help in keeping

a gang together and in good spirits. Also the living quarters should be made as comfortable as possible. It used to be said that anything is good enough for a Mexican. This, however, is not so, and the men will soon go to the road where they are provided with houses and bunk cars without leaky roofs and which are not infested with vermin.

A Mexican will work with double energy if he is promised a little time off on the completion of a certain task. A foreman who knows this can turn out more work than one who does not, by laying out a good day's work and telling his men that they are through for the day when so much work is completed. A Mexican will work hard and fast to get through with his assigned task for the sake of leaving the job a half hour earlier in the evening, but a foreman using this method should see to it that he does not promise something that he cannot perform. His word once given has to stand, for when he once disappoints his men they will lose faith in him for all time.

Accustomed to a warm climate the Mexican can do a full day's work in weather that a northern born man could not stand. As most of the track work is done in the summer months this is an advantage in favor of Mexican labor. When treated right the Mexican becomes a faithful, steady worker. He will work all day long at the most tedious kind of work without complaint when he is satisfied with conditions, and when not satisfied he can waste more time than any other kind of laborer. But the secret of handling Mexicans is not hard to learn. A foreman familiar with the general characteristics of Mexican laborers as outlined above has only to remember that Mexicans are human and should be treated fairly and kindly and he will have no trouble in getting an efficient and faithful gang of men.

CHARACTERISTICS OF THE MEXICAN.

BY M. GANLEY,

Roadmaster, Atchison, Topeka & Santa Fe, Argentine, Kan.

I have been working Mexican laborers for the past 18 or 19 years and find them about as steady a class as a whole as you can get for the money paid for track labor. When we first get them they are green, and if a foreman will treat them fairly they will work well for him. From the experience I have had running extra gangs with Mexicans I feel that I can accomplish as much work with Mexican laborers as with any other class of labor, in fact more than with some other classes. When Mexicans are first received from old Mexico they are weak on account of being underfed, but after they have been here a month or so they fill out and get strong enough to do the work, and while they remain economical and do not get to spending their money, they make good, steady men.

Mexicans must be handled like a bunch of overgrown boys. When it is necessary to discharge one of the men, one does not lose the entire gang. Mexican gangs will not permit a foreman to curse and abuse them, and where a foreman does this, if they remain with him at all they do very little work. As a rule they will not remain with him.

Mexicans are better adapted to track work than the other foreign laborers we are getting at present, but one can only build them up to a certain point. There are very few of them that make good when put out on their own responsibility.

Their manner of living is very crude. Tortitas, chille and beans, potatoes, eggs and coffee constitute their principal articles of diet. Camp facilities for them do not require very much, consisting principally of bunk cars, stoves for heating purposes in the winter, and water.

The Mexican laborer's first year is the best part of his service for the railway. After he becomes Americanized he begins to reduce on his work. After the Mexican gets so he can talk good English and smoke a pipe he is not of much use; and the case is similar with white men after they learn to speak the Mexican language and want to sit around the Mexican camp with the Mexicans and smoke cigarettes.

I find it well to work the most intelligent Mexican in the gang as straw boss in extra gangs and have gotten good results, with very few exceptions. I have never found any kind of track work on which I could not get satisfactory work out of the Mexican gangs, taking everything into consideration.

PECULIARITIES OF MEXICAN LABOR.

BY RESIDENT ENGINEER,

El Paso & Southwestern.

The Mexican laborer is the "power behind the pick and shovel" in the Southwest and West and his influence is advancing gradually toward the north Mississippi country. Coming from the south interior of old Mexico, the average Mexican of the working class is about as ignorant as is possible to conceive and usually so poorly fed and clothed that it may be wondered that he ever reached the Rio Grande. His ignorance, however, is not along all lines but along those in which we wish him to become proficient. In trades and such dealings he displays a very considerable shrewdness. In making purchases, one thing is bought and paid for, then another and another till every thing wanted is purchased or his money is gone.

Usually it takes a couple of weeks to get him "fed up" so that he is able to do a day's work. Often he reaches this country with a straw "sombrero," sandals, and a suit of clothes closely resembling pajamas. It takes weeks to get him fitted with an American outfit—shoes, overalls, shirt, jumper and hat or cap. His native hat and sash are usually the last to be changed to conform to his new surroundings. He is fond of bright colors, music, dancing, feasting and show and is a natural orator.

We quarter them in bunk houses constructed of old ties and occasionally of brick, stone or adobe; all of which are provided only with doors, windows and chimneys or fireplaces with chimneys. This is usually satisfactory till he becomes Americanized, at which time, if a married man, he provides himself with stove, bedstead and camp cooking utensils.

The Mexican is passionately fond of his family. If it is left in his home country, he is almost sure to send such money as he may be able to save. After pay day the post office and express companies do a good business sending his $2 and $2.75 to his home folk in old Mexico.

Single men are somewhat inclined to dissipate, though they seldom have enough coming to them on pay day to keep them under the influence more than a day or two. They are often quarrelsome when dissipating. A Mexican is usually easily satisfied if he has sufficient clothes to keep him comfortable and enough to eat, together with a cigarette.

I have seen these people work in large gangs where they were privileged to board at a commissary table or to buy their own provisions and do their own cooking as suits them best. When eating at the commissary table they never get enough, and often make themselves sick by over-eating. When buying their own provisions, however, they never buy too much, often living on as little as 15 cents per day.

When at work they want to bunch up and all work and talk together. Best results are obtained by working them in gangs of from six to 30. Where the character of the work is such that a larger gang is necessary the men should be separated and put under sub-foremen. They are good workers when once trained, and in many lines of work become experts. Like other labor they are very susceptible to flattery. Much additional work and improvement may be accomplished by competition among the gangs. Foremen who speak their language have a decided advantage over those who do not. The Mexican will stay longer, do more and better work if his foreman can talk to him in his own language. The greater number of foremen learn enough words in a short time to be able to direct the men at work

and to understand their wants. Many Mexicans make good foremen, and like most other nationalities are more severe on their countrymen than the average American foreman.

The first frost in the fall usually finds the foreman without men. This condition does not last long, however, and with his feet tied up in old gunny sacks, a bath towel around his neck and wearing mittens or gloves the Mexican will shovel as much snow as any one and will work for days at a time with but little rest or food, during snow blockades, washouts and wrecks. After the rush and excitement is over he wants to rest.

During the last four years the Mexican seems to have allied himself with the American "hobo" and now wants to be on the move, especially the single ones. A reported increase in wages in, say Kansas, may take half the laboring Mexicans from west Texas. They are inclined to be clannish. Families and near relatives will not stay on a job unless all that are able are allowed to work together. Occasionally it happens that a foreman will discharge a laborer for some misconduct, and in so doing will lose the gang or family. Dissatisfaction is easily spread among them, unless the foreman speaks the language and takes an interest in keeping agitators out of the camp or gang. Strikes are not uncommon among them and if their demands are granted they are very likely to all leave the work, and as often if demands are refused keep right on at work and do better work. I have known them to throw down their tools and walk out without any provocation whatever and when questioned could offer no reason for their action.

The foreman who is courteous to his men, not familiar, and who assists them in their troubles, sickness and minor accidents is sure to always have a good gang, who will do anything for him at any time.

It takes a long time to educate the old Mexico Mexican sufficiently to make a foreman or for general work. Put on one class of work, however, as a lamp tender, or watchman on a bridge or bad piece of track, he soon becomes proficient, and takes the same interest in and care of it as though it were his own property, and takes pride in doing so. On this class of special work he displays originality and ingenuity, but on a general run of section work many are discouraging to the ordinary foreman. Becoming accustomed to the work, the foreman, and the country in which he works, many of them are satisfied and stay on the job for years. The general rule is that he wants to go back to Mexico where "uno peso" will buy as much of the necessities as $5 in the United States.

They have more feast days and holidays than all other peoples combined and it is usually impossible to get them to work on any of these days or on Sunday. His Fourth of July falls on September 16. He is strong in demonstration, speech making and "Vivi Mexico" and "Vivi Hidalgo."

COST OF BALLAST ON NEBRASKA RAILWAYS.—The cost of various grades of ballast used on Nebraska railways is given as follows in the report of the Nebraska State Railway Commission on the valuation of Nebraska railways:

Gravel, Sherman Hill, Wyo., f. o. b. pit, per cu. yd.	$0.11
Gravel, Atkinson and Eureka, Neb., f. o. b. pit, per cu. yd.	.15
Gravel, Chillicothe, Ill., f. o. b. pit, per cu. yd.	.12
Gravel, Oral, S. D., f. o. b. pit, per cu. yd.	.16
Gravel, Grand Junction, Ia., f. o. b. pit, per cu. yd.	.15
Gravel, Cheyenne River and Guernsey, Wyo., f. o. b. pit, per cu. yd.	.12
Crushed stone, Louisville and Meadow, Neb., also Blue Springs, Neb., f. o. b. quarry, per cu. yd.	.65
Stone quarry screenings, f. o. b. pit, per cu. yd.	.20¼
Slag, f. o. b. Omaha, per cu. yd.	.20
Cinders, f. o. b. any division point, per cu. yd.	.22
Sand, f. o. b. any pit, per cu. yd.	.12
Burnt clay, f. o. b. pit, per cu. yd.	.48

Average weight of ballast material per cu. yd.—

Gravel, Sherman Hill, lbs. per cu. yd.	2,950
Gravel, all others, lbs. per cu. yd.	3,200
Crushed stone, lbs. per cu. yd.	2,400
Cinders, lbs. per cu. yd.	1,680
Burnt clay, lbs. per cu. yd.	1,700
Slag, lbs. per cu. yd.	3,360
Sand, lbs. per cu. yd.	3,300

CREOSOTED WOOD BLOCKS FOR PURPOSES OTHER THAN STREET PAVEMENT.

BY E. A. STERLING.

Creosoted block for street pavement can be safely said to have reached a point where it is recognized on its merit, and in several towns and cities it is the standard form of construction. This point has been reached only by overcoming much prejudice and misunderstanding regarding the character and value of creosoted block pavement laid according to modern methods. Not only has it been necessary to convince city engineers of the value of wood as a pavement, but the competition of other forms of pavement had to be met; in many cases paving material manufacturerd or advocated by concerns of long standing had to be displaced before wood block could be accepted. If the wood block business had not been in strong hands and, in more recent years, received the support of the lumbermen through their associations, its merit would have been even more slow of recognition.

Unbiased opinion now gives creosoted wood first place as the superior pavement, and its intrinsic value, backed by strong organizations, is bound to lead to its rapidly increasing use. In fact, a comparative statement by years of the amount of wood block treated shows a growth that is phenomenal. The number of cubic feet of paving block treated in 1908 is reported as 1,260,000, while in 1911 slightly over 10,000,000 cu. ft. were treated, or an increase of about 700 per cent. The 1911 output is equivalent to approximately 3,874,000 sq. yds., and probably all except a very small per cent. used for street pavement. It is stated on competent authority that there are fully 9,000,000 sq. yds. of creosoted wood block pavement now in use in the United States. Many problems have arisen in connection with the use of wood blocks, but they are all on a fair way to an early solution, and the engineer and the scientist will work out all the problems if unhampered by retarding influences.

Accepting creosoted wood blocks as the coming city pavement, the time is ripe for considering the use of the same material for floor covering and other purposes not in any way connected with street work. Beginnings have been made here and there in the use of wood in miscellaneous structures, but the developments have not progressed sufficiently to permit outlining more than a few of the possibilities, and a forecast of the future.

Briefly enumerated, the locations where creosoted wood blocks could be used to advantage would include floor coverings in factories, machine shops, roundhouses, warehouses, baggage rooms, etc., bridge decking, runways, driveways, etc.; driveways of ferry boats and floors of station platforms, driveways to buildings, etc.

The railways could profitably use creosoted block for miscellaneous purposes to a greater extent than any other consumer; yet the aggregate area of floor space in manufacturing establishments would also be very large. Considering the railways specifically, there are many locations where wood block could be used to great advantage, and it is of interest that this form of floor construction has already received consideration, although to not nearly the extent which is justified. The Fort Worth & Denver City used creosoted blocks in 1911 in covering a large storehouse platform; the B. & O. Chicago Terminal placed about 4,000 sq. ft. of creosoted yellow pine on their bonded freight house floor in the same year; the Missouri & Texas laid over 14,000 sq. yds. under cover for driveways and elevated platforms where freight is handled; the Southern paved a new boiler shop with yellow pine blocks; the Southern Pacific is beginning to use blocks for bridge decking; the Baltimore & Ohio used creosoted yellow pine blocks for inside floor in a machine shop and freight houses in 1911; while the Penn-

sylvania Railroad has made extensive experiments with wood blocks for freight platforms, shop floors and bridge decking.

The Pennsylvania Railroad had treated in its own plants, up to the beginning of 1912, some 12,000 sq. yds., mostly in the form of blocks 3 by 8 in. in cross section and 3 or 4 in. deep. The initial use of these blocks was on overhead roadway bridges, where they were laid on a sand cushion, with transverse and longitudinal expansion joints of oakum and pitch. Later, wood blocks were laid experimentally on shop floors, and untreated yellow pine blocks have been used in several passenger station baggage rooms, where they are thoroughly protected from the weather. Most of the blocks treated at the company plants were of yellow pine impregnated with 15 to 20 lbs. of straight creosote per cubic foot. A mixture of filtered tar has not been used in any case, nor is it considered necessary. Most of the blocks have been laid too short a time to give definite results, but there are no indications of failure from decay, and all promise well except a small number of gum blocks which were used on an overhead bridge. These blocks, after a year's service, buckled very badly during rainy weather, and several tiers of blocks had to be removed from time to time to take care of the expansion. Yellow pine blocks on the same bridge did not expand sufficiently to give any trouble.

The use the Pennsylvania has made of wood blocks is believed to be fully justified on the ground of long service and low cost, and good results are expected. The work, in a way, is experimental, and one of the lessons already learned is in regard to the character of the foundation and filler on overhead bridges. Results up to date would indicate the advisability of using a bituminous filler, either of pitch or asphalt, and dipping the blocks in hot pitch as they are laid upon the decking or concrete foundation. All expansion should be provided for by longitudinal joints, no transverse joints being necessary. An easier method equally as satisfactory is to apply a wash coat of heated bituminous filler to the decking or surface of the concrete base, spread entirely over the surface, into which while hot, set creosoted blocks, close jointed, fiber vertical. For inside work, as in shop floors, a pitch filler would not be necessary, since there would be no water to accumulate between the blocks.

The advantages of wood blocks for the several purposes named are so obvious as to hardly need reiteration. As is known, they will stand the hardest wear under the heaviest traffic for an indefinite period, and the result of heavy wear is only to press the whole structure into a solid mass, the slight "brooming" of the end fibers being advantageous rather than otherwise. In shop floors, where heavy machinery is handled and heavy weights are frequently dropped, there is no flooring which will show as few indentations as creosoted yellow pine blocks laid with the grain vertical; and at the same time, because of its elasticity, it is not harmful to machinery and tools. It is quiet, is not affected by oil or acids, is easily kept clean, and is sanitary and dustless; while finally, as one of its greatest advantages, is its great fire-resisting qualities.

Aside from the railways, factories and manufacturing concerns would find wood block an excellent floor covering. Asphalt is too soft, solid concrete is too hard, and wooden planking decays, splinters, and gives a rough, undesirable surface. The wood block can be easily laid on any smooth and solid foundation, and for inside work requires only a sub-foundation with a sand-cement cushion, mortar bed, or bituminous wash; for floors above the ground line it is light and can be easily applied with slight modifications of the usual form of construction.

One of the most important factors in considering wood block for use in situations other than street pavements is the character of the treatment. The difficulties which have arisen in various cities from the bleeding of the blocks and the tracking of the oil on carpets and floors can be avoided if proper care is given to treatment and construction. Moisture is one of the prime essentials for the development of fungus growth, and the varying moisture conditions of city streets produce conditions very favorable for decay; hence a heavy treatment, with waterproofing constituents added to the creosote, is the common practice. The same conditions prevail to a considerable extent on overhead bridges, and in this case a heavy treatment of creosote, either with or without the addition of filtered tar or other waterproofing substances, is desirable. In such situations there would be little or no objection to the oil oozing out on the surface of the blocks.

For inside work, where the moisture present is in the form of dampness from underneath or occasional wetting on the surface, a light treatment with pure coal tar creosote would be ample to prevent decay indefinitely. The exact amount of oil used would depend on conditions; but, generally speaking, it is believed that for shop floors, driveways and courts around buildings and other situations where there is considerable tendency to decay, but not as unfavorable conditions as prevail in the city streets, a 10 to 12-lb. empty cell injection per cubic foot will be ample. For baggage rooms, station platforms and locations where surface cleanliness is essential, a still lighter treatment with 6 or 8 lbs. by the Reuping process would be sufficient. English cities secure good service from wood blocks treated with a comparatively light injection of straight creosote, and if this holds true under street conditions, the light treatment in protected situations should be ample to practically eliminate decay for all time.

EXTRA GANG ORGANIZATION.*

BY M. HENRY,

Supervisor, Chicago & Eastern Illinois, Salem, Ill.

The first thing to be considered in organizing an extra gang is the equipment for camp cars. These should be selected with a view to taking care of the number of men required in as few cars as possible in order to be able to locate camps at advantageous points where there is little track room and to avoid the necessity of carrying a great amount of track material for construction of temporary camp tracks and the expense of laying them, when necessary to spur out.

The outfit, unless organized for surfacing or ballasting only, should be supplied with a full kit of track laying, as well as surfacing and ballasting tools so they will be available for any kind of work on short notice.

The foreman should be sober, thoroughly honest and reliable, a good organizer and able to distribute his men so each will be doing the particular kind of work for which he is best suited. It is a good idea to use section foremen to handle extra gangs, but care should be used to select men who have shown some ability to handle large gangs and who are good managers. They should have a few months' experience as an assistant to a good experienced foreman on a gang where they would have the opportunity to learn methods of handling work with which they are often entirely unfamiliar.

The class of labor for extra gangs, unfortunately, is governed by supply and demand. For all around track work, the old time hobo gang cannot be beaten. For construction, rail renewals and similar work, this class of labor should be provided if at all possible. If not available, negro laborers will do very well. For ballasting and surfacing, foreigners will do fairly well, when laborers usually classed as hobos cannot be secured.

Owing to the decline in quality of labor and increasing business on most main lines, large extra gangs cannot be worked economically. A gang of 40 or 45 laborers with a foreman and one or two assistants if the particular work requires it, and a reliable time keeper, will be found the most convenient and economical for all purposes.

*Received in the contest on The Organization of the Extra Gang, which closed April 25, 1912.

RAZING AND ERECTING THROUGH TRUSS BRIDGES WITH AN AMERICAN DITCHER.*

BY R. P. BLACK.
Engineer Maintenance of Way, Kanawha & Michigan, Charleston, W. Va.

In taking down overhead truss bridges by the use of a steam wrecking derrick and an American ditcher machine the expense and trouble of erecting the falsework necessary for an overhead traveler can be avoided. This was successfully done in tearing down a 165-ft. steel through truss bridge which was replaced by a two-span single-track through girder bridge, designed for a heavier loading, each span being 106 ft. long. The floor system of the truss bridge was supported on falsework, bents being constructed under each panel point. By beginning with the end batter posts and carefully working out on the structure, each overhead member was easily lowered with the boom of the ditching machine which could reach to a greater height than the top chord. A hitch was made at the center of the overhead member with the cable from the boom of the ditching machine, and it was then lowered on a flat car over which the ditcher traveled. The derrick was also used to handle the uprights, etc., after the top chords were taken down, thereby facilitating the work.

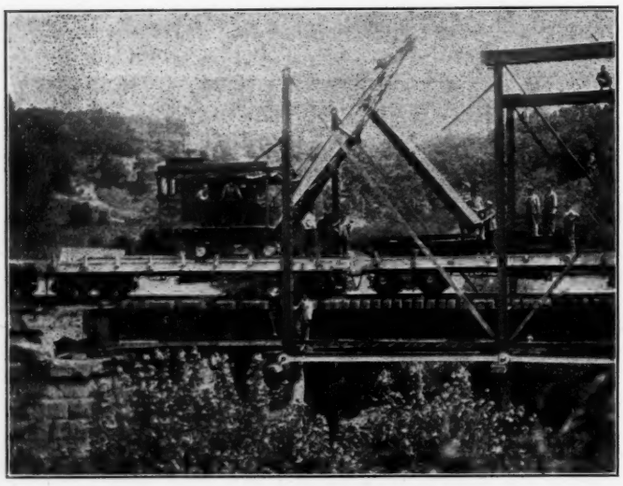
The rivets were then cut in the connections at the panel points in the floor system, the falsework knocked down and the floor system allowed to fall into the river. The new bridge had been erected and riveted up on the masonry and falsework at the end of the truss bridge, and was moved into place on rollers working on rails slightly inclined towards the track. By means of blocks and tackle the main pull was made by the cables from the hoisting machine of the wrecking crane, which was well anchored on the track about 100 ft. from one end of the bridge. In addition to the wrecking crane, jacks and crabs were used in assisting to move the bridge. After the new spans had been pulled into place the floor system of the old truss bridge was easily picked up from the river bed below by the wrecking crane and the ditching machine. The entire bridge, except the floor system, was removed in two days in this manner. A work train handled the ditching machine and the derrick car and worked on the main track between trains, tearing down the bridge without any serious delay to traffic.

In another instance connected with the erection of a new 80-ft. skew single track girder bridge, the same machine was used very successfully to set in place the floor beams and stringers of the floor system. This bridge is located on a proposed line change, and was erected before the new track was put into service, so that it was not necessary to maintain traffic over the bridge during erection. It is a five-panel bridge with four-floor beams weighing about four tons each, and ten floor stringers with the necessary diagonal braces, etc.

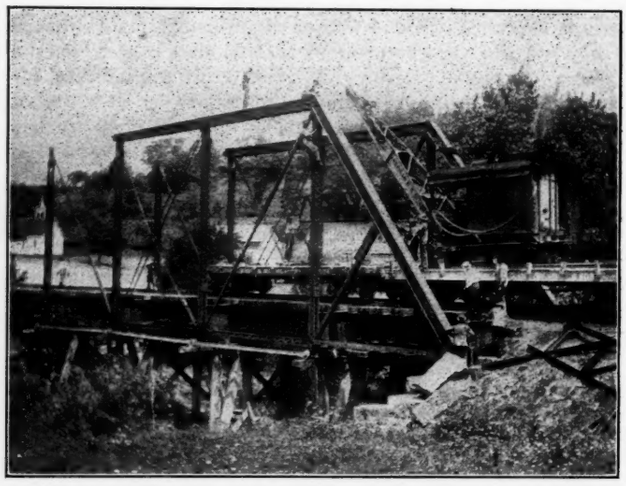
The 80-ft. girders were first unloaded with steam derricks and placed on the masonry on each side of a temporary trestle bridge. The superstructure, including floor beams, etc., was unloaded on the main track at the switch leading to the new change of line about 1,000 ft. distant from the new girder bridge. A work train with two flats, one for the ditcher and one for material, was used for this work. The ditcher worked from one end of the bridge and in placing the first two panels of the floor system at the opposite end, ran out on the temporary track on the pile bridge, only that half of the temporary bridge under these two panels having been pulled down at first. After these two panels were placed, the remaining half of the falsework was dropped into the stream, allowing the other floor beams and stringers to be placed by the ditcher working on the track back of the abutment.

The girders were spread apart enough to allow the floor beams to be lowered between them, but close enough so that each floor beam could be temporarily supported until all of them were in place. When this was done the girders were jacked into their final location and the floor system was well drift bolted, preparatory to riveting.

The temporary trestle was pulled down and the floor system put in place in five hours. After this was done, in the remaining five hours of the working day, all the timber of the temporary trestle available for other work was lifted from the creek by the ditcher and loaded on flats for shipment to another bridge. The force used for this work consisted of a train crew for the work train, an engineer to run the ditcher, and a bridge gang consisting of foreman and 12 men.



Lowering a Top Chord Member.



Dismantling a Through Pratt Truss.

The accompanying views show the ditcher taking down the superstructure of a single track through Pratt truss of 110 ft. span on an 8 deg. 30 min. curve. The four panel points of the floor system were supported by falsework which was only heavy enough to support the load of the ditcher and flats, including the dead load of the truss bridge, traffic being diverted to a revised line. The superstructure of the truss was taken down and loaded on flats in one working day of 10 hours. The equipment used consisted of a work train to spot the flats for loading and the ditcher with the boom equipped with a single hoisting line and the necessary chains for hitches. The force used consisted of a foreman and 10 bridge carpenters.

After the superstructure was torn down the floor system was cut apart, one panel at a time taken up and loaded by the ditcher working off of the end of a flat car spotted next to the panel from which the floor system was to be removed.

*Submitted in the contest on Bridge Kinks, which closed June 25, 1912.

THE ROADMASTERS' ANNUAL CONVENTION.

Report of the Thirtieth Convention of the Roadmasters' and Maintenance of Way Association at Buffalo.

The thirtieth annual convention of the Roadmasters' and Maintenance of Way Association was held at the Hotel Statler, Buffalo, September 10 to 12 inclusive. This convention was one of the most successful in the history of the association, over 250 roadmasters being in attendance. The reports of the association indicated that it is in a very healthy condition, over 185 new members having been received during the past year. The membership is now over 650, showing a net increase compared with last year of over 125 members, while the finances are in an equally strong condition. The officers of the roadmasters' association were: A. M. Clough (N. Y. C. & H. R.), president: T. F. Donahoe (B. & O.), first vice-president; M. H. Connolly (Cin. Nor.), second vice-president; L. C. Ryan (C. & N. W.), secretary and treasurer.

An interesting feature of the convention was the presence of section foremen of nearby roads. Among others, 28 foremen of one subdivision of the New York Central were present, while a supervisor of the Lehigh Valley sent 11 of his foremen to attend sessions one day.

The convention was opened by prayer by the Rev. Gardner. In the absence of Mayor Furham, of Buffalo, John A. Sayles, secretary to the mayor, welcomed the convention in behalf of the city of Buffalo.

B. M. McDonald, division engineer, N. Y. C. & H. R., welcomed the convention on behalf of the railway men at Buffalo. Mr McDonald referred to the training necessary to develop an efficient roadmaster and the fact that he must study conditions and then work out remedies to suit. He emphasized the field which came especially within the province of the Roadmasters' Association and enumerated problems which were outside of the scope of other associations, dwelling especially upon the foreign labor and section foreman problems.

In his opening address to the convention, President A. M. Clough dwelt at some length upon the early history of the association, the work it had done and the principles it had stood for. He compared track conditions when the association was formed with those existing at the present time and those likely to be encountered in the future. He showed that the problems before the association are continually changing and that it must continue its work to keep abreast of developments. He emphasized the benefits to be secured by the roadmasters meeting in this association to exchange ideas upon these constantly changing problems and also to study the latest developments in tools and machinery as exhibited by the supply concerns.

STONE BALLAST.

Rock ballast should be made from hard, tough, durable trap, flint, or limestone rock, or other hard stone, acceptable to the chief engineer or engineer of maintenance of way. The stone should be broken to cubes, the largest of which will pass through a 2½ in. ring and the smallest of which will be retained on a 1½ in ring. The crushed stone should be free from screenings, dirt and rubbish.

Ballast can be handled in side dump cars with flat bottoms, or coal cars, but the Roger ballast, Hart convertible or any similar type of ballast car on the market will secure very good results. After being unloaded ballast should be handled with a spreader, the Roger ballast plow giving very good results.

The track should be prepared for ballast by digging out all the old ballast down to the bottom of the ties, and rounded up to ½ in. above the bottom of the ties in the center. This will keep the ties from running together until the track is filled with stone. The ballast should be leveled off at end of ties.

All decayed ties should be removed and replaced with new ones. Ties should be properly spaced, the track put to gage and all spikes driven down so that the ties will be tight up to the rail. Then the crushed stone ballast should be unloaded to fill up between the ties in the center of the track. This will help keep the track in line and prevent the ties from bunching. Eight or 12 in. of stone ballast should be placed under the ties if possible and a minimum depth of 4 in. should be maintained.

In raising track on a 9-in. raise, the track can be put up in one lift if a large force of men can be secured. Ordinarily the track is put up in two lifts. In raising in one lift, the foreman in charge will soon learn by practice how many rails a train of 15 or 20 fifty-ton cars will raise to the required height. The number of rails are counted off and sufficient ballast is unloaded and plowed out. Four men are started making places for jacks. One end of the sight board is placed on a stake, and the board leveled. Four jacks are used; two, one-half rail ahead of the others, the first pair raising the track about one-half the required height.

No tamping is required with these jacks, as the stone runs under the track by its own weight. The second pair of jacks raise the track to the required height. A force of twenty men should follow behind, whose particular work it is to tamp, and these should be followed by a foreman and eight men to keep the track in perfect line. The first half of the day should be given to raising the track, the balance of the day being devoted to tamping and lining.

Where two lifts are made, the ties should be tamped their entire length with shovels. After the second lift, the ties should be tamped with tamping picks or bars, the tamping extending from the ends of the ties to 12 in. on the inside of the rail. Particular attention should be paid to tamping under the rail, but the center of the ties should not be tamped.

In dressing up single track, the ballast should be filled in at least within 1 in. of the top of the ties and should slope from the ends of the ties to the edge of the ballast shoulder. This shoulder should not be less than 4 ft. from gage line of outside rail to the edge of shoulder.

Double track should be dressed in the same way, the stone in the center ditch being level with the stone in the track. When the track is bonded for electric signals, it is very desirable that the stone be kept below the base of rail. After being raised, the track should be left from four to six days before dressing up.

In handling 600 to 1,000 yards of stone daily and giving the track a 9 to 12 in. raise, the force employed largely depends on the amount of traffic handled, and the views of the maintenance of way officials. A force of 40 to 50 men should be used in the work. A force of men organized as follows will give excellent results:

One chief foreman; 1 assistant foreman to raise track; 1 assistant foreman to line track; 2 men flagging; 4 men digging out for jacks; 13 men on jacks (4 digging holes, 8 on jacks, 1 with levelboard); 20 men tamping; 8 men lining; 1 water boy (or more if necessary).

Committee—Fred B. Adams (P. & R.); John D. Boland (U. P.); A. M. Clough (N. Y. C. & H. R.); Henry Kleine (C. & A.); Wm. Brandt (C. & N. W.); Michael Deltgen (C. & N. W.).

MINORITY REPORT, BY D. FOLEY (M. C.)

In the main I agree with the report of the majority of the committee. I disagree with them, however, on the size of stone which they recommend for use, as I believe it to be too large for the maintenance of good track. My idea is that the stone should run from 1¾ in. as a maximum to ½ or ¾ in. as the minimum.

I do not believe that we should make stone crushers of our

men, which certainly must be done if large stone is used in jointing up track in after years.

DISCUSSION.

The question of the proper maximum and minimum sizes of stone for ballast and also the question as to whether limestone should be accepted for stone ballast, were discussed at some length.

N. McNabb (M. C.) stated that limestone was used on his division for ballast, screenings being mixed in with the stone.

A. M. Clough (N. Y. C. & H. R.) objected to the use of limestone as it deteriorates and crumbles when exposed to the weather. In one quarry on the New York Central where there are strata of trap rock overlying limestone, the contractor is prohibited from crushing any limestone, although this means increased expense. A large gravel pit at Batavia, New York, was abandoned because small limestone pebbles were mixed with gravel which crumbled under the weather.

F. M. Dinan (L. V.) stated that limestone of maximum size of 2½ in. is giving very good results on his division.

J. P. Corcoran (C. & A.) stated that 300 miles of stone ballast had been put in the track on his line in the past 10 or 12 years. This limestone is secured from three different quarries and is very hard.

Upon vote of the convention it was decided to allow limestone to be considered suitable material for ballast in accordance with the original committee report.

J. Johnson (N. Y. C. & H. R.) stated that he has used stone ranging from 2 in. down to ½ in. for over 14 years with very good results. He found that he was unable to keep track up on stone crushed to 2½ in. maximum size as well as with a smaller size.

T. Hickey (M. C.) objected to stone as large as 2½ in. for ballast as he did not believe it is possible to keep up good track on it.

J. E. McNeil (A. T. & S. F.) stated that he used stone of maximum size of 2 in. and minimum size of ½ in.; being in a dryer climate the question of drainage was not so important with him.

G. Lowers (Erie) objected to stone as large as 2½ in. because, with the labor now secured, it is impossible to surface track with it. He preferred a smaller stone which will tamp more readily under the tie.

L. C. Ryan (C. & N. W.) stated that he has secured stone from two different quarries, in one of which the largest stone is 2 in. and the smallest ½ in. in size and in the other the stone ranges in size from 2½ in. to 1½ in. Working under the same conditions regarding labor, roadbed, etc., and putting in from 8 to 10 in. of ballast under the ties in two drifts, he found that he could not keep the track up on the coarse stone. With the smaller stone he had very little difficulty in maintaining the track, as this stone worked in between the larger pieces, making a solid foundation. He advocated stone ranging from a maximum of 2 in. to a minimum of ½ in. in size. The report was amended to recommend the sizes advocated by Mr. Ryan.

FOREIGN LABOR.

It is plainly evident that we must depend almost entirely upon the foreigner for our source of labor supply for the present as well as the future. The question which then confronts us is: "How are we to obtain efficiency from this class of labor in the shortest space of time?" Your committee has devoted considerable time to a study of this question, and we respectfully submit our recommendations.

The first point to be considered is the method of obtaining the services of these men. Where it is possible to do so we would recommend that the necessary labor force be obtained locally by the roadmaster or foreman. If the required number cannot be secured in this manner, we would then suggest that the railways establish a labor bureau of their own at some central point where laborers usually assemble to seek employment. Let it be the policy of these railway labor bureaus to furnish free employment, free transportation and, when necessary, send a company representative with the men to their destination and turn them over to the foreman for whom they were engaged without any first cost to them. By this means the man so employed will readily realize that he is placed upon his own resources and that upon his own individual energy will very materially depend how long he will be retained in the service.

The next method in obtaining laborers is through the regular employment agencies. This method is not always satisfactory, due to the fact that through their eagerness to secure a shipment of laborers and earn the fee connected therewith, the agencies too often make promises of future increase of wages and concessions of various kinds that local railway officials cannot fulfill. The result of these ill-advised promises is trouble and discontent among the men and worry and trouble for the roadmaster and his assistants. As a means of partly preventing this abuse, an impartial representative of the railway company should be appointed whose business it should be to scrutinize all contracts made with the men and satisfy himself that nothing is promised either for the present or the future except what can actually be fulfilled. The necessary information regarding the kind of work, probable length of time of employment, etc., can always be obtained from the local or general offices of the company, and this information should be given to the men. We are not in favor of hiring laborers through the regular employment agencies except where it is impossible to secure them by the other two methods mentioned.

We are very much opposed to the method of furnishing laborers by interpreters, bookmen, commissary men, etc., on promises of appointment as interpreters, sub-foremen and timekeepers for the gangs or acquiring boarding house privileges for the purpose of furnishing meals and lodging to such laborers as they engage. The concession usually demanded by this type of labor agency is that the agent be appointed interpreter, sub-foreman, timekeeper or commissary man for furnishing a certain number of men. As an interpreter, sub-foreman or timekeeper his authority over the gang is such that it is difficult to cull out the poor material and replace with a better class of men without losing the entire gang, as the leader is unfortunately too short-sighted to realize that with a better grade of labor he has a vastly better chance to secure steady employment. It often happens that the interpreter extorts a certain amount of money from each "green" foreigner for whom he secures work on his assurances of steady employment. He thus practically binds himself to keep these men at work regardless of their fitness or unfitness. The sole interest that the commissary man has in the labor he supplies is to extract from the men every penny possible by charging exorbitant rates for provisions which they are compelled to purchase from him and an extortionate rent for small and unsanitary sleeping quarters.

The result from such a system is a perpetual "green" gang. The men are fleeced to such an extent that as soon as they earn a few dollars which they can call their own they quit their unprofitable jobs and inexperienced new hands are furnished in their places.

There is no hope under this system of ever getting any satisfactory results for any of the parties interested except the commissary men.

The next point to be considered is the best method of housing the men so that, by improving their living conditions, we may the more easily obtain and retain their services. Owing to the fact that conditions vary on different railways and in different localities, the details of furnishing quarters for the men must be largely a matter governed by such conditions. For the average section gangs, shanties of suitable size with good light and ventilation and with sleeping rooms separate from the living room, particularly when the men do their own cooking, should be provided. Where better accommodations cannot be

furnished, old box car bodies remodeled with the necessary windows, doors and partitions, well ceiled and with good floors, make good, cheap shanties. All shanties should be furnished with the necessary lamps and a heating or cooking stove as the occasion demands.

The proper housing of the men is a most important matter as an aid in keeping the men satisfied and in increasing their efficiency. Where men are properly housed they are always willing to return to the same company year after year. Good treatment of the men in this respect usually results in their continuing in track work when they might otherwise engage in other occupations.

The sanitary conditions are most important. Necessary toilets must be maintained. The foreman in charge should closely watch and insist that the buildings occupied and used by his men are at all times kept neat and clean, and that the grounds surrounding the buildings be also kept tidy. A great deal of the local prejudice against foreign labor is due to the filthy habits that on the surface seem to be general among the men. One cannot exercise too much supervision over this particular feature.

Extra gangs should be fitted out with good cars with stoves, light, and ventilation. There should be plenty of room for sleeping quarters or bunks. Some companies provide portable shanties which are placed on flat cars in summer and moved from station to station as desired. In the fall at the close of the extra gang season, the shanties are removed from the cars and the flats turned back into logging or lumber service. All railways cannot do this, but they can and should provide living quarters for their laborers somewhat suitable to the needs of a human being. The sanitation of these outfits should not be overlooked and every one should be alert to avoid complaint in this important matter. A watchman or carekeeper should be employed to keep the extra gang cars neat, clean, comfortable and warm for the men when they come in from work at night. Such a man could also find time to look after the care of all tools not in daily use.

How to obtain the confidence and increase the efficiency of the foreign laborers in the shortest space of time is a problem. Much depends on the foreman. Those of us who have gone through the mill of actual experience realize that it is not an easy task to make good track men out of Italians, Japs, Greeks and Mexicans and still more difficult to teach them to speak and write the English language. Make them obedient to American laws so long as they remain in this country and perhaps later on they may develop into competent foremen.

This requires a great deal of care and patience on the part of the foreman, but with proper energy and a determined "I will" spirit, success will follow. The first thing, therefore, is to obtain the confidence of the men. All gangs of men cannot be handled by rule, but observation of their habits and inclinations will show how they should be approached to obtain the best results. Avoid abuse. Explain to them as clearly as possible just what is to be done. Make no promises to them that cannot be fulfilled. Allow them full time for every moment they work. Give them liberal allowances of time and proper food when used overtime in emergencies in stormy weather. Keep them always under submission by granting them no concessions if a threat to quit accompanies their request. Instruct them to become law-abiding citizens and of refraining from being quarrelsome. Do not permit them to carry or possess any kind of dangerous weapons. Accustom them to the idea of keeping their home surroundings neat and sanitary. Explain to them how best to make their purchases of clothing and provisions so that they won't be fleeced by men of their own nationality who may have been somewhat shrewder than they and have started small stores for this purpose. Aid them to learn the English language by explaining to them the names of the various track tools and equipment they come in contact with every day. By such means as this foremen can gain the confidence of their men and make them good and efficient track men in a short time. All of this can be accomplished if the foreman is given proper aid by the roadmaster and the railway company, particularly the latter. Except in emergencies, there can and ordinarily should be arranged a uniform summer and winter force particularly for sections.

There is no feature of track maintenance of such importance as the organization. Railway companies should readily anticipate their wants and proposed expenditures as regards the section forces each year. The labor sheet should accordingly be gotten up promptly and thoroughly for both winter and summer service. For the summer work an average force of men should be employed early in the spring and such a gang kept on each section until the fall, except in the case of those railways where it is desired to get the track in shape for the many additional trains by which to take care of the heavy suburban summer traffic.

We do not approve of interpreters without any knowledge of track work. Ordinarily on sections there will be found one or more men in each gang who understand sufficient English so that they can explain to the others just what the foreman wants. Where large gangs are employed and a man of the same nationality as the others is found capable to act as a sub-foreman, he should be employed as such at a suitable increase in salary over and above that paid to the laborers. The man so appointed should be given to understand that his retention depends entirely upon his success in getting the best results out of the men in that capacity and his possible advancement to the position of foreman later on, provided he shows himself capable and deserving. As we must depend very largely on the class of labor which we now employ for foremen of the future, we deem it a wise plan that, where any member of a gang shows ability and takes an interest in the work, he should be given some supervising part such as lining or surfacing track, and to provide an opportunity for the development of such men into foremen, a small, floating gang should be placed in their charge to assist various sections as required.

This method gives the student an opportunity of working under different foremen and we believe that it is a very good method by which to educate foreign laborers for the position of track foreman. The salary of such a man need be only a little above that of the ordinary laborer, but he should be employed the entire year. Some railways allow sub-foremen on some of the most important sections as a means of educating them for the position of foremen at a minor increase in wages above that of the laborers, always selecting the most experienced man and the one who shows the strongest disposition and desire to learn. This also proves a very successful plan. We find that such foreigners make very good foremen and in many instances get better results out of the men of their own nationality than do American foremen. This, of course, is in a great measure due to the fact that they can talk to and explain the work to their men. In addition they take part in the work with their men much more than do American foremen who are loath to work alongside a gang of foreign laborers. One of the greatest drawbacks, however, in making foremen out of foreign laborers is their inability to read or write the English language.

Committee—Coleman King (L. I.); P. J. McAndrews (C. & N. W.); G. M. Greene (C. R. I. & P.); J. W. Fletcher, Jr. (Car. & N. W.); C. C. Johnston (L. & N. W.); A. B. Richards (L. E. & W.); B. A. West (A. T. & S. F.).

DISCUSSION.

M. Burke (C. M. & St. P.) stated that he believed the rate of pay largely governed the class of labor secured and referred to the Italians who were paid 45 cents an hour for work in cities and were giving good results, even if foreign. By paying only 15 cents an hour, railways get little choice of labor.

J. P. Corcoran (C. & A.) stated that it had been his experience that the steel mills and other industries take the best men from his gangs, leaving the poor ones. He advocated a higher

rate of pay, but strongly disapproved of giving a man more hours than he worked to effect this increase. The instructing of foremen to give his men 11 hours' pay for 10 hours' work encourages deceit on their part. If necessary to increase the wages in order to hold the men, this increase should be made in the hourly rate.

J. E. McNeil (A. T. & S. F.) stated that the wage question is simply one of supply and demand and that there are not enough men in the country to do the work which is to be done. He stated that his company finds it advisable to protect the men against overcharging by commissaries and does not require them to board in camps.

J. Johnson (N. Y. C. & H. R.) stated that previous to the establishment of commissary cars three years ago, he received very few complaints from the men. They were allowed to go where they desired for supplies and purchased them mainly in the local stores, although in some instances they secured the supplies from New York, paying the freight themselves. Many men had come back to him each season for 15 or 20 years. With the establishment of the commissary cars, complaints immediately began to come in regarding overcharging and other abuses. He advocated a return to former conditions.

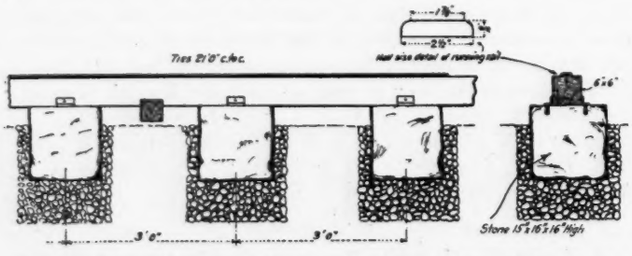
L. C. Ryan (C. & N. W.) advocated a raise in wages so that those paid by railway companies would equal approximately 85 per cent. of those paid by contractors. With such a rate railways will have no trouble in holding the men, as men will work for a railway company for this rate in consideration of the transportation, lodging and other accommodations furnished. He also believed that the raising of wages would make the men more anxious to retain their positions and for that reason the company would secure better work from them.

DEVELOPMENT IN STEEL RAILS.

Dr. P. H. Dudley, consulting engineer, New York Central Lines, presented a paper on The Development in the Past Three Decades of Rail Sections, Higher Standards of Track, Heavier Equipment, Wheel and Train Loads and Faster Schedules at the session Wednesday morning, of which the following is an abstract:

The railways in the United States in 1911 had 243,229 miles of line, of which 149,933 were constructed since 1880. The second, third and fourth tracks, yards and sidings amount to 115,587, making a total of 358,816 miles of track. Canada in 1911 had 25,400 miles of line, and Mexico, 14,990. The total railway lines in North America from the best available statistics for 1911 is 283,619, while the total for the rest of the world is 326,921 miles. This wonderful development has taken place practically within the past 83 years.

The superstructure of the track for the Mohawk & Hudson Railroad on the tableland, between the incline plane at Albany and the one at Schenectady, the construction of which was begun about 1830, was composed of an iron strap rail, 2½ in.



Track with Rigid Supports Constructed on the Mohawk & Hudson in 1830.

wide, the upper corners rounded on top to 1⅞ in. and 9/16 in. thick and spiked in the center of longitudinal stringers, 6 in. x 6 in. to serve as a girder. To make a supposed enduring track with inelastic supports in the roadbed, pits 2 ft. square and 3 ft. center to center were prepared for each line of stringers, and in each pit were placed about 9 cu. ft. of broken stone which cost $2 per cu. yd. Stone blocks were placed on these foundations each of 2¼ cu. ft., 16 in. high, with a top surface of 15 in. x 16 in. Upon these the stringers were laid and attached by knees and spikes to support the strap iron rails. The iron formed the bearing surface for the wheel contacts, and the guide for the flanges of the wheels of the passing locomotive and cars, and the stringer supplied the strength as a girder. The weight of the "John Bull" was too heavy for this superstructure and was not distributed by a wheelbase sufficient in length to ride steadily over the track, and was seldom used as originally made.

John B. Jervis was also chief engineer of the Saratoga & Schenectady Railroad, which he was constructing when he opened the Mohawk & Hudson. Three miles of the track were finished with stone blocks set upon broken stone, the same as used for the Mohawk & Hudson, and the stringers were then placed upon the stone blocks, and a small angle iron used on the upper inner corners of the stringers to form the track. Mr. Jervis built the balance of the line with cross ties upon which the stringers were placed, to support the small angle iron rails, and ballasted the track for an elastic roadbed. the principle in use today.

There were only 23 miles of railway track in this country in 1830, composed principally of strap iron rails laid upon wooden or stone stringers, which had only increased to 2,818 miles in 1840. The development of the early railways with iron rails was slow, for at first all the iron used was imported from England or Wales.

Robert Livingston Stevens designed in 1830 for the Camden & Amboy Railroad, a section of rail, the principle of which combined in one piece the bearing surface for the wheel treads, the guide for the wheel flanges and the strength for the girders, with a base to rest on the cross ties, to be spiked to them. This was the prototype of our present rail sections. It did not come into general use on account of the expense, for many years, and then the head was made more pear shaped. There had been constructed 9,021 miles of railway by 1850, and 30,628 by 1860 using iron rails, as plants for their manufacture had been built in this country.

Wrought iron was the only available material for rails and as at the best it contained 1 to 1½ per cent. of slag, it was not sound and homogeneous. As expressed by some railway presidents, it was a bundle of fibers not thoroughly welded and consolidated. Large pieces of iron often became detached from the head of the rails in one or two months' service owing to the laminations of the slabs in the piles from which the rails were rolled, when the driving wheel loads increased to 10,000 and 12,000 pounds and the speed of the express trains to 25 or 30 miles per hour.

The breakage of the rails in winter and spring was also large and the question of rail failures was discussed with even more fervor than at the present time.

The replacing of iron rails by Bessemer steel marks a distinct epoch in the maintenance, construction and operation of railways. His conception was the application of the fact that one-half of one per cent. of carbon, combined with iron, made a ductile steel of greater physical properties than wrought iron, and as cast iron contained from 3½ to 4 per cent. of carbon, a non-ductile and brittle product, he made a suitable converter, and blew air through the bath of molten cast iron to burn out the excess carbon content to that desired for his grade of steel.

This direct method proved possible only with the nearly pure Swedish ores. For all others, it was necessary to select those in which the phosphorus was .10 per cent. or under and the sulphur not much higher, and then decarburize the molten bath by blowing air through it and subsequently recarburize the blown metal with the desired carbon, manganese and silicon contents. This was a decided success, and by the large product which could be made, rendered possible the present railway

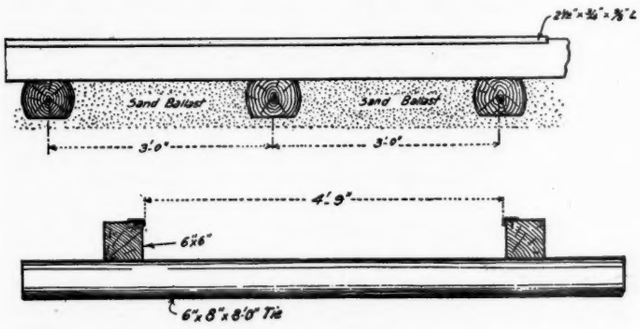
development by the use of steel rails of better physical properties than those of iron.

The use of Bessemer steel rails commenced in this country in 1863, with imported English brands of 500 to 1,000 tons for trial. The early rails cost $100 to $120 gold per ton, which, with the premium, made the cost from $240 to $260 in currency, about double the cost of iron rails, and even at those prices the investment proved economical, owing to the enhanced safety of operation and the greater life of steel rails. There were many places of heavy traffic where a steel rail rendered 10 to 15 times as much service as the iron rails.

Bessemer steel plants were built in this country in 1865. The sections of steel rolled at first were in the same passes as had been used for iron and were laid with chair joints, but there was interruption instead of continuation of the wave motion from one rail to the next through the joints, which is essential for smooth riding track.

The New York Central engineers made some deflection tests, and in 1870 increased the height of the rails to 4½ in. The weight of the section was raised from 60 to 65 lbs. per yard.

I commenced the investigation of the deflections of the rails by my track indicator in 1879. The New York Central at that



Track with Elastic Supports Constructed on the Saratoga & Schenectady in 1832.

time had 4½ in. 65-lb. steel rails in general use upon the main lines and upon some of the subsidiary lines they had 56 and 60-lb. The rails ranged in height from 4 to 4½ in. The Boston & Albany had a 4½ in. 72-lb. rail and the Pennsylvania had two sections of 4½ in. 67-lb. The light rails in general use proved too weak to distribute much of the wheel load in the wheel spacing, nearly the entire wheel load being localized on the cross ties, cutting out rapidly under the rail seats. Gravel ballast was in general use then, few roads, with the exception of the Pennsylvania, having used more than a few miles of stone for trial.

The substitution of the heavier and stiffer rails for the lighter steel sections, exhausted the low phosphorus Bessemer ores many years ago, and we were obliged to accept .10 per cent. Bessemer with .50 per cent. carbon, and these rails are the ones which have failed in the past decade.

We are now in the transition stage of substituting basic open hearth rails for the high phosphorus Bessemer. The basic open hearth furnace enables ores to be used which are above the Bessemer limits in phosphorus, as their neutral linings permit lime to be used to absorb the phosphorus from the iron and pass it off in the form of a slag which is utilized as a fertilizer. To reduce the amount of the phosphorus in the steel to a low limit of .04 per cent. or under, enables the tougher carbon to be substituted. This enables a rail to be produced which has a greater toughness, ductility and tenacity in the low temperatures than is possible in the same section of Bessemer .10 per cent. phosphorus metal.

The elongation and exhausted ductility tests of the New York Central Lines for basic open hearth rails were inaugurated in 1910 to secure those of the maximum ductility, purity and homegeneity for service in temperatures even as low as 40 degs. F. below zero. Three drop tests are made from each melt; one each from the crop of the top bar of the second, middle and the last full ingot. The crop, 4 to 6 ft. long, is stamped with a spacing bar of 6 1-in. spaces in the center of its length on the base, head or side as desired. Each butt for basic open hearth rails for acceptance of the melt must show under the drop of 18 ft. for the 80-lb. and 90-lb. sections, and 20 ft. for the 100-lb. section, at least 6 per cent. elongation for 1 in. or 5 per cent. for two consecutive inches before fracture. The ductility is completely exhausted in one test for each melt, and is made in rotation from the different ingots in succeeding melts.

The specified chemical composition should, for each melt, produce a metal of uniform and homogeneous physical properties at any given plant under suitable mill practice.

The New York Central & Hudson River and the Boston & Albany have used hundreds of thousands of tons of Bessemer rails in which the ductility was from 12 to 18 per cent. in a majority of the heats, and only a few breakages occurred in service. The prescribed tests under the drop are readily made and the conditions of manufacture as to the exhausted ductility of the metal, followed as the metals are made.

During 1911, 106,000 tons of basic open hearth rails tested under the ductility tests were rolled for the New York Central Lines. The New York Central & Hudson River had 32,070 tons of 100-lb. and 20,420 tons of 80-lb. basic open hearth rails in service the past winter, and for the year 1911 and January, February and March of 1912 there were only seven 100-lb. rails which failed, or one in 9,420. Two were removed for flow of metal, three for split heads, and two for broken bases.

Of 45,000 80-lb. rails one was broken, two removed for flow of metal, three for split heads and one for broken base. The rails were in temperatures for some days of 40 degs. below zero, and for nearly three months the temperature was above zero only two or three days.

There were 288 melts of the 20,420 tons of 80-lb. rails and the average ductility for the melts was 19.8 per cent. Only two melts were as low as 8 per cent. in ductility. The calculated average ductility from the chemical composition was 21 per cent. per inch. The results were nearly as good for the other roads of the New York Central Lines with the exception of the 90-lb. A. S. C. E., which is a deficient section for low temperatures.

This record indicates that metal of high percentage of ductility is nearly proof against broken rails, while there were numerous breakages of the Bessemer with .10 per cent. phosphorus and .50 per cent. carbon in the same tracks. Of the 2,000,000 tons of basic open hearth rails in the tracks in the United States, the breakages were also less than in Bessemer.

Half-moon breaks in rail bases have been frequent for the past decade and there is usually a trace of a slight longitudinal median seam or check, particularly in Bessemer metal, which develop as detailed fractures, and open by degrees during the cold weather. The check starts upward from the slight seam, often ¼ or ⅜ of an inch. The surfaces of the check become discolored and from a later wheel load the check opens nearly to the junction of the base and the web and then is liable to curve to the outside of the edge of the base. This fracture is always from the base upwards. Frequently another check is found on the upper side of the flange which develops downwards, due to the reverse strains in checking the rail. The same form of fracture is often seen on the base over the supports of the drop testing machine, becoming detached as a small triangular piece.

Several half-moon breaks have been found upon the base of the rail between the ties, which leaves but little question that they were originally strained in gagging at the mills. The half-moon breaks in many cases only develop in the underside of the base and are indicated to the trackmen by a slight rust line on the top of the base. The rail in other cases is often fractured through the web and other side of the base, near the curved break in one flange.

It will be important, as the wheel loads and speeds increase, to make a careful examination of these half-moon breaks to

trace their immediate contributing cause, either to abnormal conditions of the equipment or track. They take place frequently on the gage side of the rail and they often occur on the outside flange. These have become more frequent since the heavy tender loads with high centers of gravity have come into use, although it is probable that eccentric wheels on the cars, coaches and Pullmans may be responsible for some of them. The fractures seem to be more numerous on crossties with heavy tieplates.

There are cases where a number of rails were broken during the night and an eccentric wheel was found in which a small portion of the metal had flaked and dropped from the tread of the wheels. A number of breakages were found directly after the passage of these wheels, and several detailed fractures developed in a week or ten days which required the remaining rails to be taken up and the track relaid. Instances have been found in which the base of the rail had a longitudinal check in it which had not developed towards either side of the base. It is probable that in the freezing of the track the ties where the half-moon breaks occur were raised slightly above those on either side.

The seams in the base are found more frequently in the lower rails of the ingots where the skin checks in blooming and does not roll completely out in the subsequent reductions. This is often the case when the ingots are made of exceptionally sound and solid steel and bloomed under heavy passes. The basic open hearth rails with the small percentage phosphorus and sulphur do not show as many of these minute checks or seams as Bessemer with its high content of phosphorus and sulphur.

The reports which have been made about half-moon failures from over 2,000,000 tons of basic open hearth steel, only show a small percentage compared to the Bessemer, although they were straightened in the same presses. The A. R. A. sections, types "A" and "B," with their thick bases, have not developed, as a rule, as many half-moon breaks as the thinner wide based rails.

The ties over which the web splits sometimes from shearing strains are slightly higher than those on either side, as shown by the leveling instrument. The splits usually develop when the roadbed is frozen and the traffic heavy.

There are two types of broken rails. (1) Square breaks through the base and head, nearly vertical. (2) Angular breaks through the base, web and head in the form of a shear break.

These breaks usually occur during the low temperatures, and are not dangerous unless accompanied by a pipe or badly segregated or split head. These seem to be caused by the impact of a wheel of greater severity than the average. The vertical breaks I have considered due to a strain of greater intensity than the metal would distribute without checking or fracture, and indicate either a very sudden blow, settlement of the ballast, or decided fragility of the metal.

The angular break and shear form, which is not vertical, is due to a checking of the base under the maximum wheel load, completing the fracture as the wheel was moving forward, and this is a slightly less fragile metal than the vertical break.

The bearing surface of the new rail when put in the track is cold rolled by the wheel pressures. The slipping of the drivers upon the rails sometimes hardens a thin layer of the surface metal to such an extent that the ductility is practically exhausted. Then from the negative bending moments in the wheel spacing, transverse checks are started which develop as detailed fractures through the head, web and base of the rail. These occur with greater frequency in rails under compression, mostly on curves and at stations, where slipping of the drivers is more or less frequent.

Another type of head fracture is on the low rail of curves, due to the track, being laid wide gage, and the double flange of the present chamfered wheel tread, running nearer the center of the head of the rail, wears it concave, while slipping also takes place, which hardens the metal until a transverse check is started and works downward.

Both of the types are dangerous as the rails are liable to check in several places, then a piece becomes detached, and these should be avoided by maintenance.

Broken rails from interior transverse checks have only been found in rails within the past two or three years and in all cases they seem to be accompanied by impurities in the metal which become the starting point for a detailed interior check which increases in size under the moving wheel loads. A limited number of these interior transverse checks have been developd in Bessemer rails, confined to the portion in which an interior streak or defect can be observed.

It is stated in some of the investigations of the different roads that the transverse checks have only been found in the rails in which the carbon was above .80 per cent., but there are cases now known in which the carbon is under .70 per cent. These interior transverse checks have been considered by some as an indication that the wheel loads are greater than the metal can sustain. The millions of rails which have rendered excellent service in the track without the development of these interior transverse checks show that metal tolerably pure and not too high in carbon is not thus affected.

It was stated at the meeting of the International Society for Testing Materials in New York City last week in effect that it would be necessary to return to small ingots and it would be best to discard 30 per cent. of the ingots. I am a responsible official over thousands of miles of trunk line tracks, and I feel this responsibility, and will have the best and safest high-grade rails which can be made by purification of the metal to make sound steel and ingots and well finished rails. I am not ready to recommend the discard of 30 per cent. of the output, when today our mills have not sufficient capacity to supply the demands for rails, and the discard of 30 per cent. would materially reduce the output and relegate the essential care for the purification of the bath of steel already started to the following decade.

Short, stubby ingots of 8,200 lbs., or more, have been made, teemed, stripped and charged into the furnace so promptly that in good mill practice the small shrinkage cavity which is formed will be entirely discarded in the crop of the bloom.

Bessemer steel is more or less segregated, the carbon, high phosphorus sulphur and silicon separate and form a mixture which remains fluid longer than the general mass of the metal and becomes rolled out in the upper rails of the ingots in the "A" or "B" cuts.

The split heads occur mostly in this class of metal and especially when slag or sulphide of manganese or carbon streaks of cast iron cut out of the stools are drawn out in minute threads near the bearing surface of the head of the rail. The metal then breaks down and shears, while the transverse spreading metal under the wheel loads splits the head of the rails. These interior fractures become discolored and are called pipes by the trackmen. It has taken many years of study to distinguish between the split heads and the true piped rails due to shrinkage cavities. My recent investigation upon segregation of basic open hearth steel which sets dead in the molds proves that segregation is decidedly less than in Bessemer steel. The marked segregation is in the carbon, and that may be confined to 6 to 8 per cent., while that of the small phosphorus content is of little significance, for it does not increase the brittleness of the basic open hearth steel to an appreciable extent.

This must be accomplished by better drained tracks and more efficiently ballasted roadbeds to lessen the specific deflections of the wheels in the equilibrium depression under the passing locomotives and cars and thereby confine the strains in the rails to those which can be repeated many thousand times with safety in the section of rails.

The stone ballasted roadbeds will not always protect you from broken rails, for sometimes a warm rain storm may precede a cold wave and the roadbed will be frozen solid before the water has drained from the ballast. This requires that we must rely more upon the quality of the metal in our rails than in the past to meet the present service on the heavy wheel loads and high speed trains in winter temperatures.

The climate for the United States, Mexico and Canada differs widely in various localities. The heat in the summer is more intense and the cold greater in the winter than in corresponding latitudes on the continent. The temperature falls but little below zero in Great Britain and central portions of France, while the temperature in the United States above 40 deg. N. latitude will be much warmer in the summer and colder proportionately in winter.

The past winter of 1911 and 1912 was the most severe yet experienced by northern and Canadian railways. This was in part due to the extreme cold and also to the average heavier wheel loads and higher speed trains, the latter being important factors in the severity of service upon the track. The roadbeds were frozen as a rule deeper than usual, and in some places more rails were fractured upon the embankments than in the adjacent cuts. The embankments were frozen from the sides as well as the top, making a more rigid roadbed than usual.

Reports received of the service of the heavy base sections only two days before your meeting here show that the thick bases are not proof against fractures when rolled out of metal only tested under a drop, which requires about 4 per cent. elongation to accept the rails. A few melts may be passed of that insufficient ductility which heavy traffic in low temperatures will mar the good results expected. This happened in the first basic open hearth rails made in 1909 and sent to a Western railway. There were 20,000 tons and the numerous fractures were confined to five melts, which under the elongation and ductility tests would have been rejected.

HOW TO SECURE FOREMEN—ORGANIZATION AND LENGTH OF SECTION.

It is agreed that, to secure competent foremen, good wages must be paid and to secure student foremen a salary should be paid sufficiently in excess of that paid to section laborers to make it attractive to young men with fair education, ambition and ability, to induce them to stay in the track department rather than to work on farms or other places where wages may be higher but steady employment uncertain and the chance for promotion obscure.

Student foremen should be placed with the most progressive section or yard foremen so that they may learn the latest methods and be taught the most up-to-date way in which to acquit themselves when promotion comes to them and they are thrown on their own resources. It goes without saying that section or yard foremen, designated as teachers of prospective foremen, will endeavor, out of personal pride and with characteristic loyalty to their company, to turn out men who will be a credit to their instructors. These men should be paid 25 cents or more per day, above the pay of a regular track laborer, and they, as well as all foremen, should be paid for overtime over the specified working hours, the same as other employees.

If student foremen are moved into a terminal or yard after working one or two years on a straight section, they will get experience in switch work, heavy track repairs, and work of this character, and an insight into many phases of track work not encountered on sections, thus making them much more resourceful when the time comes for them to assume control of their own sections. With proper training, as outlined, and with the prospect of inviting wages as a section, yard or extra gang foreman, when the time for promotion comes, the problem of securing competent foremen will to a great extent be solved.

There should be four student foremen on every division of 25 sections and additional ones where the number of sections exceeds this. A yard foreman should receive more wages than a section foreman and it should be considered a promotion for the latter to be placed in charge of a yard. The pay of an extra gang foreman should be larger than that of a yard foreman and men selected to handle extra gangs should be next in line for the position of assistant roadmaster. This should be the settled policy of every railway. All promotions from that of student foremen and extra gang foremen to roadmaster should be held before the wide-awake, ambitious man as an inducement for him to work in the maintenance of way department.

A merit system is also recommended whereby due credit can be given to foremen in every capacity for alacrity, resourcefulness and initiative in cases of emergency, together with a full appreciation of their duties and responsibilities both night and day. The position of foreman in the track department would then be desirable.

Where the equivalent mileage basis of designating length of sections is not used, a section of four tracks should be two miles long; three tracks, two and one-half miles; two tracks, three miles; and one track, five miles. Equivalent mileage is usually figured on the principal railways at the rate of one mile of main track to a mile; two miles of main passing siding to a mile; three miles of spur, or commercial tracks to a mile; and fifteen switches to a mile. In yards, the equivalent mileage will regulate the territory which a foreman with a given number of men should have under his jurisdiction.

Each section should consist of a foreman and one man to each mile of track in summer and one man to two miles of track in winter when conditions are normal. In severe weather, however, when ice forms and snow storms prevail, a foreman should be allowed to use his judgment in having extra men to keep switches clean, tracks open and to assist wherever necessary in order to keep traffic moving from the physical standpoint of operation in such cases. Each section foreman should have an assistant for every ten men, the assistant to work the men and prevent them from getting in the way of trains.

The word "Section" embraces all main line tracks and main line switches, sidings, freight house tracks, etc., at all way stations and through large yards; yard sections to include all tracks of every description outside of main line switches.

Committee—P. M. Dinan (L. V.); L. A. Lewis (P. & R.); J. A. Roland (C. & N. W.); John Barth (C. C. C. & St. L.); Carl Buhrer (L. S. & M. S.); J. P. Corcoran (C. & A.); T. F. Donahoe (B. & O.); J. E. Wilkinson (C. & N. W.); Bruce James (C. & E. I.).

DISCUSSION.

The principal discussions on this report centered about the length of sections and the basis for arriving at the equivalent lengths of sections.

M. Burke (C., M. & St. P.) stated that the amount of work varies largely with the number of planked or paved street crossings. On some roads it is the practice in large terminals, such as Chicago, to require special planking gangs to devote their entire time to the maintenance of crossings.

N. McNabb (M. C.) stated that, based upon his experience in the city of Kalamazoo and other cities on his division, he considers the maintenance of four important street crossings as equivalent to one mile of track and that additional forces should be provided accordingly. The report was amended in accordance with Mr. McNabb's suggestion.

T. F. Donahoe (B. & O.) suggested that consideration should be given to the class of track in specifying the forces required for its maintenance, using the A, B and C classifications of the American Railway Engineering Association. He suggested that the forces outlined in the report be sufficient for class B track and that class A track be allowed 25 per cent. additional forces and the number of men be reduced 25 per cent. for class C track. It was later voted to consider the number of men outlined in the report as sufficient for class. A track applying to heavy traffic main lines, all lines requiring second track being considered heavy traffic lines.

NEW AND IMPROVED APPLIANCES.

The committee reviewed the use of shoulder tieplates, rail anchors, solid manganese frogs, manganese switch points, slide plates, etc., this report being practically the same as that of last

year published in the *Railway Age Gazette* of September 15, 1911.

Committee: W. E. Emery (P. & P. U.); W. R. Thompson (Central of Georgia); J. F. McGuigan (St. L. & S. F.); A. G. Hart (Southern Pacific).

This report was received as information.

METHODS FOR OBTAINING THE BEST AND MOST ECONOMICAL RESULTS IN HANDLING CONSTRUCTION WORK.

The committee limited itself to the consideration of the question as whether the building of new yards and main lines which were not let to contractors should be handled exclusively by the engineering department, by the maintenance of way department, or under the supervision of a practical track man.

Considering the handling of work by the engineering department, the committee held that the plans, specifications, etc., should be prepared by the chief engineer, but that the work should be in charge of a practical track man. There should be, of course, a resident engineer on the ground to lay out the work as ordered in accordance with these specifications. Ample assistance should be provided the man in charge of the work. The committee recommended that the wages paid to laborers on construction work of this character should be at least equal to that paid on other construction work in the immediate vicinity, irrespective of whether that work is of a private, municipal or railway character.

The man in charge can best ascertain the proper kind of material to be selected and the manner in which it should be placed in the sub-grade in order to eliminate the possibility of soft spots which so frequently develop in tracks under the pressure of heavy traffic and which form the most serious drawback in the maintenance of a first class track in the future. He can also provide good drainage, sufficient ballast under the ties, and proper spacing and placing of ties in accordance with the size and condition of ties provided, all of which are essential to the construction of good substantial tracks. Construction of all new track work or such tracks as come under the head of construction work should be completed in detail before being turned over to the maintenance department.

The committee recommended that the construction work should not be handled by the maintenance of way department, as the average roadmaster has as much maintenance work as he can properly attend to during the working season.

Committee: M. Burke (C. M. & St. P.); James Sweeney (C. & E. I.); Thomas Thompson (A. T. & S. F.); A. E. Muschott (C. R. I. & P.); M. Donahoe (C. & A.); George Barnoski (C. M. & St. P.); T. Hickey (M. C.).

The chairman of the committee also individually expressed the opinion that a saving in cost and time in construction work can be obtained by the use of a track laying machine in laying the first track, depending largely, of course, on good organization. Second and other additional tracks can best be constructed by unloading the necessary material from the existing track, this to apply as well to yard tracks. All necessary grading can be done by train to very good advantage when the material is not at hand to be hauled by teams.

The advantage in making train fills lies in the fact that better material can be obtained and used after the material is unloaded from the train with a side plow and leveled back to the full depth and width for an additional track. If gravel ballast is to be used it can also be unloaded and spread on the grade with a spreader to the width and height required before track laying, so that when the steel is laid there is no lifting to be done beyond surfacing or a light lift.

Because of lack of time, consideration of this report was deferred until next year.

OTHER BUSINESS.

Visit to Lackawanna Steel Plant.—On Wednesday afternoon, upon the invitation of the Lackawanna Steel Company, the convention adjourned to allow the members to visit this plant. About 200 members made the visit under the guidance of Dr. Dudley, who explained the different steps in the manufacture of steel rails to the men, and especially illustrated the methods of testing the finished rails to insure their soundness. A number of tests were executed, Dr. Dudley explaining the various steps as they progressed.

Election of Officers.—At the annual business session, the following officers were elected for the ensuing year: President, W. Shea, roadmaster, C., M. & St. P., Ottumwa, Ia.; first vice-president, T. F. Donahoe, supervisor, B. & O., Pittsburgh, Pa.; second vice-president, W. R. Thompson, roadmaster, Cent. of Ga., Macon, Ga.; secretary and treasurer, L. C. Ryan, roadmaster, C. & N. W., Sterling, Ill.; member of executive committee, T. Thompson, roadmaster, A., T. & S. F., Joilet, Ill. Chicago was selected as the location for the next convention.

Banquet.—The convention closed on Thursday evening with a banquet given by the Track Supply Association for the members and guests of the Track Supply and Roadmasters' and Maintenance of Way Associations in the banquet room of the Hotel Statler. C. H. Stein, engineer maintenance of way, Central of N. J., spoke on the subject of conservation, calling attention to the necessity of continued observation on the part of a roadmaster in order to study conditions closely and to devise methods for their improvement. He also emphasized the importance of resourcefulness, defining it as the meeting of conditions as they present themselves. Observation itself results in nothing. Resourcefulness is discovering and applying the remedy. In this line he called attention to the field for the study of the economical handling of labor and material in order to secure the most for the railway for every dollar spent.

J. V. Neubert, engineer of track, N. Y. C. & H. R., described the development of rails, tie plates and track structure to keep pace with the development in locomotives. He emphasized the fact that the duty of the roadmaster most neglected today, is the proper instruction of his foremen, and advocated the substitution of personal instruction for letter writing.

H. J. Pfeiffer, engineer maintenance of way, Terminal Railroad Association of St. Louis, dwelt upon the problems encountered in the maintenance of large terminals and showed the importance of proper maintenance of frogs, switches and crossings and the relation of this expense to that of other maintenance work.

Mr. Abbott, inspecting engineer of the Lackawanna Steel Company, described the manufacture of steel rails from the loading of the ore to the finished product.

Visit to Ramapo Works.—On Friday the members and their wives spent the morning at Niagara Falls, reaching the factory of the Ramapo Iron Works at noon, where luncheon was served, after which the members were shown through the frog and switch works. Following this, W. C. Kidd, president of the Track Supply Association, on behalf of the members of the Roadmasters' and Track Supply Associations, presented retiring President Clough with a handsome silver set.

TRACK SUPPLY ASSOCIATION.

The meeting of the Track Supply Association, held in connection with the Roadmasters' and Maintenance of Way Association, indicated a flourishing condition in the organization. Over 40 supply firms made exhibits at the convention, this number and the standard of the exhibits being considerably above those of previous years.

The officers of the Track Supply Association for the past year were: W. C. Kidd (Ramapo Iron Works), president; A. H. Weston (Lackawanna Steel Co.), vice-president; F. A. Preston (P. & M. Co.), secretary.

The following were elected officers of the Track Supply

Association for the ensuing year: President, A. H. Weston, Lackawanna Steel Company; vice-president, Walter Allen, Pennsylvania Steel Company; secretary and treasurer, W. C. Kidd, Ramapo Iron Works; members of executive committee, E. M. Fisher, Fairbanks-Morse & Company; W. J. Fairbank, Elliot Frog and Switch Company.

EXHIBITS.

The following firms had exhibits during the convention:

Ajax Forge Company, Chicago.—Ajax manganese guard rail. Represented by Mr. Elfberg and H. C. Hutchins.

Alex. Milburn Company, Baltimore.—Acetylene lights. Represented by Mr. Pollard.

American Guard Rail Fastener Company, Philadelphia.—Guard rail clamps and rail benders. Represented by D. F. Vaughan.

American Hoist and Derrick Company, St. Paul.—Transparent photographs of American ditcher in operation. Represented by Ed. Coleman and Geo. Haight.

American Valve and Meter Company, Cincinnati.—Switch stands and safety switch locks. Represented by J. T. McGurry and F. C. Anderson.

Jas. C. Barr, Boston.—Brown rail unloader. Represented by J. C. Barr and R. H. Anthony.

Buffalo Forge Company, Buffalo.—Forges. Represented by E. G. Leonard.

Carnegie Steel Company, Pittsburgh.—Carnegie steel tie and Duquesne rail joints. Represented by N. C. Hench, F. C. Dening and S. G. Ellis.

Chicago Pneumatic Tool Company, Chicago.—Section motor car. Represented by Chas. E. Walker, J. W. McCook, Ross Watson and Thomas Aldcorn.

Chicago Steel Railway Tie Company, Chicago.—Section of steel tie track. Represented by J. Alvin Hyle.

Dorpmueller Co., New York.—Creep checks. Represented by A. Dinklage, J. C. Barr and R. H. Anthony.

Fairbanks, Morse & Co., Chicago.—Section motor car. Represented by E. M. Fisher, D. J. Higgins, F. H. Douglas, Geo. Akers and R. H. Connard.

Fairmont Engine Company, Fairmont, Minn.—Literature. Represented by Mr. Wade.

Hayes Track Appliance Company, Richmond, Ind.—Hayes derails. Represented by E. T. Ruby and S. W. Wallace.

Hobart-Allfree Co., Chicago.—Derailers. Represented by W. H. England.

John Gearon, Sr., Chicago.—Steel tie. Represented by John Gearon, Sr., Edward Gearon and M. V. Gearon.

Joyce-Cridland Co., Dayton, Ohio.—Track jacks. Represented by Chas. D. Derby.

Indianapolis Switch & Frog Company, Springfield, Ohio.—Switch stands, manganese switch points, models of manganese frogs and crossings. Represented by E. C. Price.

Lackawanna Steel Company, Buffalo.—Abbott joint plates and hook shoulder tie plates. Represented by A. H. Weston.

M. W. Supply Company, Philadelphia.—Vaughan rail anchors, foot guards and splice straighteners. Represented by David L. Vaughan.

National Lock & Washer Company, Newark, N. J.—Nut locks. Represented by Mr. Seymour.

National Malleable Castings Company, Cleveland.—Tie plates, rail anchors and anti-creepers. Represented by J. W. Stevenson, C. L. Johnson, L. S. Wright, Tom Aishton and Geo. B. Martin.

National Manufacturers Company, Waterloo, Iowa.—Handcar engines. Represented by M. Cummings.

P. & M. Co., Chicago.—Rail anchors, tie renewers, bond wire protectors, crane guard rail retainers. Represented by F. A. Preston, Geo. Johnson, D. T. Hulberg, J. Hubbell and L. W. Kent.

Pennsylvania Steel Company, Steelton, Pa.—New Century switch stands; Mayori nickel chrome steel heat treated frog bolts—photographs. Represented by W. H. Allen, H. Barbee, Elmore DeWitt, D. Salsich, Stanley Smith, G. S. Vichery and C. A. Alden.

Positive Rail Anchor Company, Louisville, Ky.—Positive rail anchor and tie plate; economy switch points. Represented by W. M. Mitchell, J. C. Haswell, R. H. Johnson and J. C. Long.

Pratt & Letchworth Co., Buffalo.—Literature.

Q. & C. Co., New York.—Bonzano rail joint, Bonzano rolled step joint, Vaughn anti-creeper, Q. & C. special guard rail clamp, tension guard, rail clamp. Represented by J. A. Bodkin.

Rail Joint Company, New York.—Continuous, Weber and Wolhaupter joints. Represented by Geo. Isbester, Wm. E. Clark, Mr. Holloway, Mr. Boyce, R. Smith, Mr. Chapman and Chas. Jenkinson.

Railroad Supply Company, Chicago.—Tie plates. Represented by M. J. Comerford.

Ramapo Iron Works, Hilburn, N. Y.—Switch stands. Represented by J. E. Davidson, Arthur Germunder and W. C. Kidd.

Railway Age Gazette, New York.—Copies of *Railway Age Gazette* and *Signal Engineer*. Represented by C. R. Mills and E. T. Howson.

Railway List Company, Chicago.—Copies of *Railway Engineering* and *Maintenance of Way & Railway List*. Represented by J. M. Crowe and K. L. Van Auken.

Sellers Manufacturing Company, Chicago.—Tie plates. Represented by J. T. Markham, J. C. Barr and R. H. Anthony.

Southern Railway Supply Company, St. Louis.—Saunders corrugated car stopper. Represented by M. E. Towner and W. D. Achoff.

Vaughn Rail Support Company, St. Louis.—Rail supports. Represented by Mr. Vaughn.

Verona Tool Works, Pittsburgh.—Track tools. Represented by Wm. Paul, Mr. Fisher, Mr. Woodins, J. C. Barr and R. H. Anthony.

Henry Ware, Springville, N. Y.—Ware improved tie plate, gage and tie surfacer.

Walter McLeod & Co., Cincinnati.—Carbide lights. Represented by Wm. Hext.

TIMELY SUGGESTIONS.

BY A. SWARTZ,

Engineer, Maintenance of Way, Toledo Railways, Toledo, Ohio.

Now that the summer work is drawing to a close it is well for everyone in the maintenance of way department to be thinking of the winter to come. It is to be hoped that we will not experience a winter so severe as that of last year, but the lessons learned should make us alert so as not to be caught again.

There were so many broken rails last year that we should all have determined some causes of breakages. So many moon shaped breaks occurred in the base of rails that it would be well to see if the rails are lying smoothly and evenly on the ties. Wherever there is a slight tendency to cant it should be rectified. Where new rail has just been laid it is possible that adzing was done in such a hurry as to be poor. See that the ties are well tamped at joints and quarters. On tie plated track see that the rail bears evenly on the plates and that the plates have full bearing on the ties.

Where the recent rains have puddled the ballast under joint ties it is well to dig this out and replace with new material for such a condition will tend to weaken the joints and break the rails near the end.

Go over the angle bars again and replace any that are so badly worn as to improperly fit the rail. Poor bolts making improper supports at joints have a tendency to cause rail breakages within the limits of the angle bar. On sections where excessive rail breakage occurred last winter it would be well to have a good supply of angle bars, bolts and spikes so as to be prepared for breakages which may exceed the number of patching rails kept on hand. An efficient method of temporarily repairing a broken rail is to place a pair of angle bars in the web of the rail. Then if no drill is at hand instead of drilling and applying bolts, take a track bolt with a nut on the end. Place the head of the bolt in the hole of the angle bar and let the nut end rest on the tie. Drive a spike into the tie against this nut. If possible apply two bolts in this manner on each side of the pair of bars. This then acts as a rail brace and will make quite a secure job.

It would be well on some rainy day to make a lot of shims by taking the good part of some old ties. This of course applies to roads that do not buy their shims.

Roadmasters should gather up all the extra gang tools not now needed and see that they are put in condition for use next year and for supplying the needs of section gangs this winter which, of course, will not be very great. This is a question which means a great deal of money to railways, and roadmasters cannot put too much stress on it. Hand cars should be gone over to see what parts may be necessary to renew and the cars put in easy running condition, for this is essential in winter with reduced forces and head winds against which a gang must pump.

Now is the time that water barrels should be looked over to see that they are in good condition and that an adequate supply is on hand at bridges and buildings. Salt and snow brooms should be ordered, for very often one finds these supplies very depleted just when they are most needed.

Dead grass and weeds should be cleaned away from bridge openings and burned, so as not to clog such openings. Ditches should be cleaned out as weeds have stopped growing, thus affording plenty of outlet for winter rains and thaws. Snow fences should be repaired and put in place so this work will not be delayed by lack of force later on. Nearly all roads will reduce forces in October.

Go over road crossings and see that the planking is put in good condition—renewing where necessary any planking which will not last this winter. Tamp up any joints which may come in crossings, renewing the ballast where the recent rains have puddled the joints. Provide suitable ditches or drains at cross-

ings as heaving track occurs more frequently at such places. See that all flanger signs needed are in place. At unimportant farm crossings it is often possible to take out the plank and fill with ballast, thus reducing the number of chances for heaving crossing plank, which we all know to be a source of worry and danger.

By all means collect all scrap and get rid of it, thus getting a credit for the maintenance of way stock as well as improving the appearance around tool houses. Where new rail has been laid a great many spikes suitable for use on side tracks may be obtained by sorting them when such scrap is picked up.

Inspection of switches and frogs should be made to see that braces and bolts are in good condition to last through the winter. Gage which is not uniform should be corrected at once, for this leads to bad line and then bad surface and wet joints during the winter. Water cranes should be gone over to see that valves are working properly, also that the drainage from the pits is in working condition, as this is a great help in winter when water stations are generally working to capacity.

Providing proper draining outlets in yards is another important matter generally overlooked until too late. Good drainage can be easily provided by hollowing out the ballast down to bottom of ties or an inch below, between tracks. Ballast should be cut away between ties across tracks at various places if pipe is not obtainable. Drainage around ash pits and round houses should be in first-class condition, for the winter weather will always show up improper drainage at such places.

AN INTERESTING METHOD OF RENEWING THREE TURNTABLES WITH THE MINIMUM DELAY TO TRAFFIC.

During the past year the Chicago & Alton has replaced three 65 ft. deck turntables with 90 ft. through turntables at Venice, Ill., and at Slater and Kansas City, Mo., to accommodate heavier engines. These three points are among the busiest on the Chicago & Alton and the tables are in use almost constantly. For this reason it was necessary to reduce the period of time which they would be out of service to a minimum and the following method was adopted:

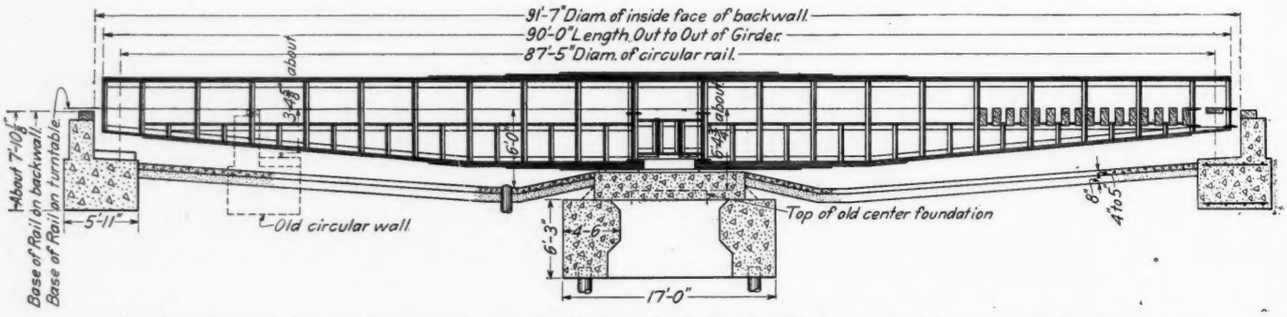
At each of the three terminals the center pier of the turntable rested on the natural foundation and the piers had been driven down, requiring a timber grillage to be placed between the top of the pier and the bottom of the center casting to maintain the proper elevation of the turntable. To eliminate any settlement in the foundations in connection with the new 90 ft. turntables, a row of piles was driven around the old center foundations by means of a track driver operating from the old turntable. This circular row of piling was capped with a semi-reinforced concrete jacket which completely encased the old center pier. As shown in the sketch, the top of this concrete jacket was finished off at an elevation slightly below that of the old center pier so that the old table could turn above this new concrete jacket without any interference.

The concrete jacket was designed to support the table and the load is distributed to it by means of a reinforced slab on which the center bearing rests. This slab was constructed at a convenient distance away from the table and was provided with lifting stirrups so that it could be placed in position with a derrick car after seasoning.

The new outer circle wall is located 12 ft. 6 in. back of the old wall and was constructed in sections of about two or three engine stall lengths at a time, so that only this number of stalls was thrown out of service at any one period. After the new outer circle wall was completed the earth between it and the old wall was removed and the old back wall was cut down sufficiently to clear the new turntable when it was swung. In the interval between the removal of the excavation and the placing of the new turntable, the tracks were cribbed across the 12 ft. 6 in. gap between the two walls with bridge timbers.

The new table was completely assembled a short distance from the pit so that it could be conveniently conveyed to its location at the proper time. On the day selected for changing out the old table, a temporary track was cribbed across the turntable pit on which the wrecking derrick was run opposite the center of the old table. This table was picked up, carried out and placed to one side, out of the way. The cap stone on the old foundation was then pried off which reduced the elevation of the top of the old masonry to a point below that of the concrete jacket. When the steam wrecker was preparing to pick up the large center slab, a mortar joint was laid over the top of the jacket to care for any inequalities in the slab or concrete jacket and permit the slab to be levelled up. The slab was then picked up by the wrecker, carried to the pit and carefully brought to its proper position. Two steam derricks, one at each end, then picked up the new 90 ft. table, carried it to the pit and lowered it on the center casting resting on the concrete slab. The entire time consumed in these operations from the time of cribbing a track across the pit until engines could be turned by the new table was about eight hours.

This work was handled under the direction of E. L. Crugar, assistant chief engineer and J. W. Reid, bridge engineer of the Chicago & Alton, to whom we are indebted for this information.



Section Through Center of Turntable Pit, Showing New Center Pier and Position of Old Foundation.

Costs of Culverts in Nebraska.—The Nebraska State Railway Commission gives the following costs for culverts as determined in its valuation on Nebraska railways:

Concrete and stone arch culverts (semi-circular) complete, including excavation, foundation piling, wings, forms, etc.—

4 ft. wide at spring line	$42.00 per lin. ft. of barrel
6 ft. wide at spring line	50.00 per lin. ft. of barrel
8 ft. wide at spring line	60.00 per lin. ft. of barrel
10 ft. wide at spring line	80.00 per lin. ft. of barrel
16 ft. wide at spring line	140.00 per lin. ft. of barrel
20 ft. wide at spring line	180.00 per lin. ft. of barrel

Timber box culverts (12 in. x 12 in. with 2 in. floor)—

1 ft. x 2½ ft.	$3.75 per lin. ft.
2 ft. x 2 ft.	4.50 per lin. ft.
2 ft. x 3 ft.	5.00 per lin. ft.
3 ft. x 3 ft.	6.00 per lin. ft.
3 ft. x 4 ft.	6.75 per lin. ft.
4 ft. x 4 ft.	7.75 per lin. ft.
4 ft. x 5 ft.	8.50 per lin. ft.

ABSTRACT OF ENGINEERING ARTICLES SINCE AUGUST 16.

The following articles of special interest to engineers and maintenance of way men, and to which readers of this section may wish to refer, have appeared in the regular weekly issues of the *Railway Age Gazette* since August 16:

Palmer-Providence Line of Grand Trunk.—The entrance of the Grand Trunk into New England has been watched with interest by railway men throughout the country. The plans for the Palmer-Providence line—which is now under construction—and for the proposed Boston entrance, were described and illustrated in the issue of August 23, page 338.

Recent Flood in Louisiana.—The amount of damage done to railway property by the recent overflows of the Mississippi river is not generally realized. An article in the issue of August 23, page 344, describes the situation accurately and includes a map and several interesting illustrations.

Large Scherzer Bridge for England.—A short description of a Scherzer rolling lift bridge of unusual dimensions, to be built over the Trent river at Keadby, England, for the Great Central Railway of England, was published in the issue of August 23, page 345.

Table for Finding Proper Tonnage Rating.—The calculation and uses in fixing tonnage rating of a set of tables giving acceleration and retardation for locomotives working under full throttle and drifting on various gradients, was described by Paul M. La Bach, assistant engineer, Chicago, Rock Island & Pacific, in the issue of August 23, page 347.

Plans for New Chicago Union Station.—The railways entering the Chicago Union station have decided upon a location for the new terminal. The reasons for deciding upon the new location were given in an article appearing in the issue of August 23, page 354, and the scheme of the Chicago Plan Commission for a proposed civic center to include the new Union station, is described and illustrated in the issue of August 30, page 390.

A Study of Broken Rails.—C. E. Lindsay, division engineer, New York Central & Hudson River, Albany, N. Y., presents some interesting analyses of rail failures on page 381 of the issue of August 30. In a letter to the editor, published on page 419 of the issue of September 6, R. I. Wilby, assistant engineer, Toledo, Peoria & Western, comments on Mr. Lindsay's article.

Erection of Willamette River Bridge.—The unusual features in the erection of the new double deck lift bridge which is being built by the Oregon-Washington Railroad & Navigation Company over the Willamette river at Portland, Ore., at a cost of almost one and three-quarter million dollars, were described and illustrated in the issue of August 30, page 382.

The Terminal Situations at St. Louis and Chicago.—In an editorial on page 416 of the issue of September 6, the present development looking to the improvement of freight terminal conditions in the city of Chicago and the lack of similar development in the city of St. Louis, are commented upon.

A Complicated Waterproofing Problem.—W. S. Lacher, office engineer, Chicago, Milwaukee & St. Paul, on page 432 of the issue of September 6, describes the installation of automatic stokers and coal and ash handling machinery in the company's power plant at the West Milwaukee car shops, which required the building of new concrete foundations and conveyor tunnel, ash pits and track hopper, involving some unusual and difficult problems in waterproofing the concrete.

Great Northern Realinement over the Transcontinental Divide.—The Great Northern line between Summit, Mont., and Java, has been revised to eliminate curvature and a double track has been built over this section, involving some very heavy track work. A short description of this work was published on page 435 of the issue of September 6.

Electrification of Oakland Suburban Lines.—The Southern Pacific has electrified its existing steam suburban lines reaching the cities on the eastern shore of San Francisco Bay, and has built a number of additions; the electrified portion including 29.3 miles of road, most of which is double track. The track work, stations. electrical equipment and cars were described and illustrated in an article by R. T. Guppy, engineer, suburban lines, Southern Pacific, published on page 460 of the issue of September 13.

Insuring Soundness in Steel Rails.—An abstract of an article presented to the sixth congress of the International Association of Testing Materials by Robert W. Hunt, was published on page 464 of the issue of September 13. Mr. Hunt advocates testing a rail from each ingot and discarding one-third of the ingot until methods are developed which will insure their being sound. An editorial comment on this article appears on page 457 of the same issue.

UNIT PRICES OF TIMBER BRIDGES.—The unit prices for timber bridges as determined by the Nebraska State Railway Commission in the physical valuation of Nebraska railways is as follows:

Piling, ordinary foundation and trestle, per lin. ft. in place.	$0.45
Piling, 34 ft. and longer, per lin. ft. in place.....$0.65 and	.70
Piling, sheet, 3 in. plank, per lin. ft.....	.08
Timber, Douglas fir, per M. B. M. in place.....	38.50
Timber in Howe truss, per M. B. M. in place.....$43.50-	48.00
Timber in piers, per M. B. M. in place.....	41.00
Timber, creosoted, per M. B. M. in place.....	45.00

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION CONVENTION.

The annual convention of the American Railway Bridge & Building Association will be held at the Hotel Emerson, Baltimore, October 15, 16 and 17. Extensive preparations are being made for this convention, and judging from the committee reports already received, the outlook is excellent for one of the most profitable sessions held in recent years. The following is the program:

MONDAY, OCTOBER 14.

Meeting of the executive committee at eight o'clock, followed by the president's reception and informal dancing.

TUESDAY, OCTOBER 15.

Morning session 10 a. m.

Convention called to order by the president.
Address of welcome and response.
Reading of the minutes of the last meeting.
Report of executive committee, secretary and treasurer and other committees.
Admission of new members.
President's address.
Appointment of committees.

Afternoon session.

Reports of committees and discussions.

Evening.

A trolley trip to Bay Shore Park.

WEDNESDAY.

Morning and afternoon sessions.

Reports of committees and discussions.
Unfinished business.
New business.

THURSDAY.

Morning session.

Election of officers.
Selection of meeting place for 1913.

Thursday afternoon will be devoted to a trip by boat to Annapolis. A light lunch will be served on the boat. Members and guests will be shown through the grounds and buildings of the United States Naval Academy, after which they will be received at the executive mansion by the governor of Maryland.

Committee reports will be presented on the following subjects: Fireproofing timber trestles; derricks and other appliances for handling material in supply yards; sash—size and kind of glass for round houses and shops; concrete tank construction; best and most economical pumping engines; roofs and roof coverings; reinforced concrete culvert pipe; the construction and maintenance of long pipe lines for locomotive water supply, intakes, pump pits, reservoirs, etc.; the development of turntables to meet operating conditions for the modern locomotive, showing most improved practice; track scales—construction and maintenance; painting of structural iron or steel, for both bridges and buildings; relative merits of brick and concrete in railway buildings and platforms.

VALUE OF TOOLS USED IN MAINTENANCE WORK.—The value of tools used by maintenance forces is given as follows in the report of the Nebraska State Railway Commission on the valuation of Nebraska roads:

Average allowance per section gang per set.....	$120.00
Average allowance per extra gang per set.....	600.00
Average allowance per bridge gang per set.....	600.00
Average allowance per roadmaster's inspection car, etc., each	125.00
Average allowance per bridge supervisor car, etc., each.	125.00
Average allowance per signal supervisor car, etc., each..	125.00
Average allowance per signal maintainer car, etc., each.	150.00

MODERN CROSSING DESIGN.

BY F. W. RIZER,
Assistant Engineer, Chicago, Burlington & Quincy, Chicago.

It was formerly the practice with most railways when a new crossing was required to furnish the manufacturer with the angle, weight and section of rail and the drilling for the proposed crossing, and to depend on the manufacturer for the design and construction details. In this case each manufacturer followed his own standards of construction, which were accepted by the railways. Under these conditions it was possible for a dishonest manufacturer to bid low to get the order and then skimp both on material and labor in order to make a profit, and at best there was a lack of uniformity. The different manufacturers from time to time added certain improvements to their designs which were the result of careful study and many tests, so that when the railways began to design their own standards of construction there was plenty of reliable data at hand.

The principal advantages of having a standard plan are: First, uniformity; and second, each manufacturer knows exactly what is required to the smallest detail, and there is no chance of misunderstanding.

There are two factors which determine the construction of a crossing: First, the angle; and second, the traffic which is to pass over it on both lines.

With respect to angle, it is the present practice to construct crossings having an intersection angle varying from 30 to 35 deg. up to 90 deg. with rails which have been cut and butt against each other. This is known among the manufacturers as crossing construction. Where the intersection angle is less than 30 or 35 deg., the crossing usually consists of four frogs, two end and two center, the construction of which is similar to that of a turnout frog in which the rails are bent, and which is known among the manufacturers as frog crossing construction. Where the angle is less than 12 deg. it is good practice to provide movable point center frogs if there is an interlocking plant at the crossing from which the movable points may be operated in connection with the signals and derails.

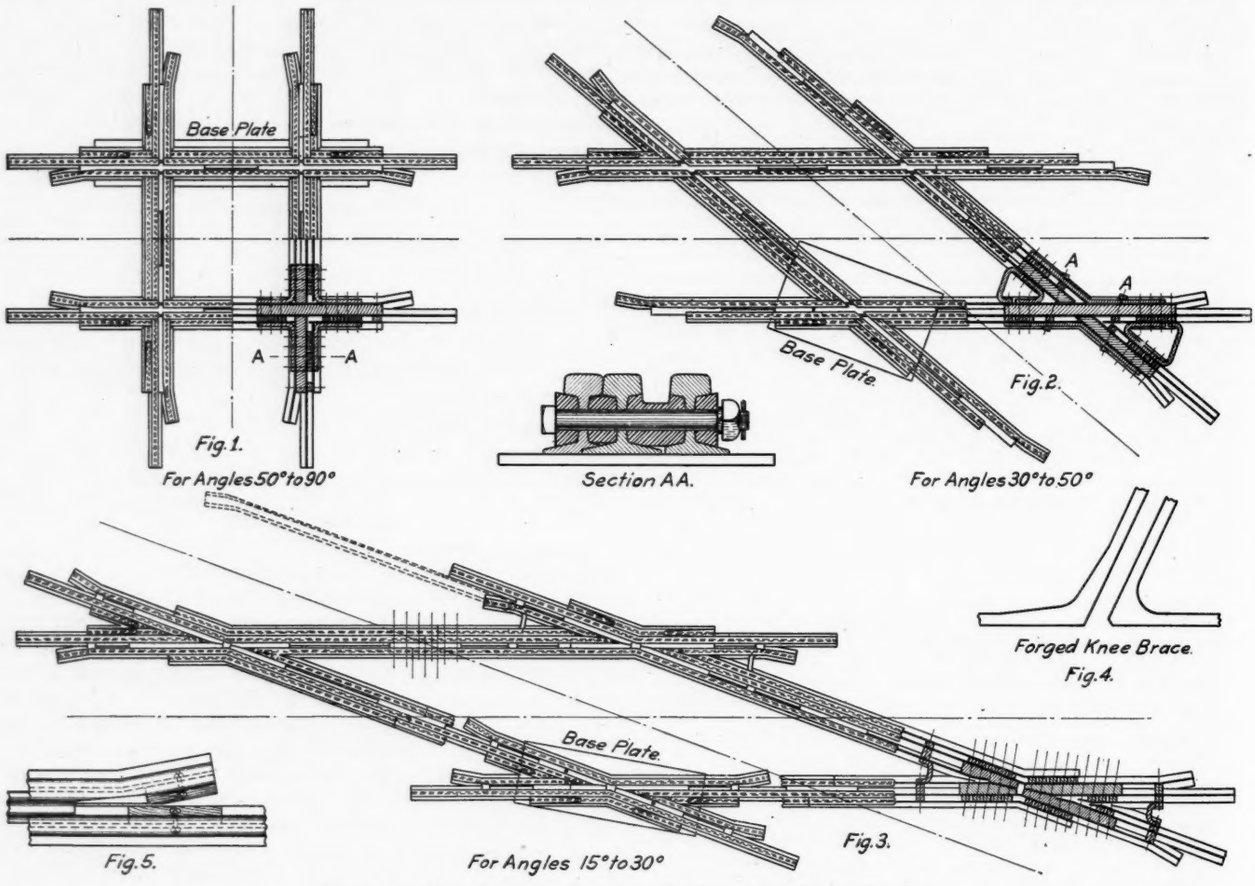
With respect to traffic, crossings are usually designed to meet the following conditions:

1. Two high speed main tracks.
2. One high speed track and one secondary track.
3. Two secondary tracks.
4. One high speed track and one electric line.
5. One secondary track and one electric line.

1. The first case requires the heaviest construction throughout, three rails being used on each side, the running rail, guard rail and easement rail. Fig. 1 shows a 90-deg. crossing of this type. Fig. 2 is a 40-deg. crossing of the same type, and Fig. 3 a 20-deg. crossing. It will be noted in Figs. 1 and 2 that the running rails and guard rails in the superior track are through rails and that the fillers between them also extend through. The fillers in the other track extend to the web of the running rails and guard rails. This arrangement provides a firm and substantial support for the running rails at the flangeway where it is most needed. In the three-through-rail construction, which was quite extensively used a few years ago, the fillers in the secondary track ended at the web of the easement rail, a cast iron filler being placed between the guard and easement rails.

2. Where one high speed track crosses a secondary track no easement rails are provided on the secondary track, except where the traffic is heavy as in the case of a switching lead, in which case it would be economical to provide the easement rails.

3. Where two secondary tracks cross the easement rails are usually omitted, to reduce the cost of the crossing.



Types of Crossings of Approved Designs for Heavy Traffic.

4. Where a high speed track crossed an electric or interurban track it has been the practice to provide three through rails on the high speed track, cutting a groove about ¾ in. x 1¼ in. across the heads of the rails to provide a flangeway for the smaller wheels used on the electric lines. Instead of separating the running rails and guard rails by a filler the two rail heads were placed against each other and a groove planed out of the guard rail for a flangeway which coincided with the notch in the rails of the high speed track. The present tendency is to provide a filler and standard flangeways as the equipment of electric lines is rapidly being increased to steam railway standards.

5. The construction of a crossing for a secondary track and an electric line is the same as described above, except that the easement rails are usually omitted.

Referring to Fig. 2 it will be noted that the outside guard rails of the center frogs are extended to protect the end frogs. This is accomplished by extending the guard rail beyond the joint and providing a joint filler, which arrangement provides a firm and substantial joint. Where the angle is less than 20 deg. independent guard rails are installed to protect the end frogs, and the easement rails and inside guard rails are shortened. If one of the tracks is on a curve it is a good practice to provide a through guard rail on the inside of the curve.

The following specifications represent the present practice in regard to the construction details:

Rail.—It is not economical to use rail lighter than 70 lbs. or 75 lbs. except in extraordinary cases. At a crossing where the rail in each track is of different weight it is good practice to provide a rail or two of the heavier section on each side of the crossing in the track with the light rail. This brings the step splices away from the crossing and reduces the wear at the joints. The through rails in crossings, the angle of which is from 35 deg. to 90 deg., are sawed through at the flangeways. If this is not done the rails very often break at this point, and as the break is usually irregular excessive wear results.

Fillers.—Steel fillers are rolled to fit the various rail sections. These are cut and machined as required. Some manufacturers forge the fillers for frog crossings from old car axles, especially where a wider flangeway than 1¾ in. is required.

Plates.—Wrought iron plates from ¾ in. to 1 in. thick are used to support the crossing and distribute the wheel loads over the tie. The method of applying the plates varies somewhat among the different railways, but Figs. 1, 2 and 3 show a common practice. There are two methods of attaching the plates to the crossing. In one method the plates are riveted to the crossing through the fillers in the superior track, permitting the outside arms to be removed for shipment. In the other method cast or malleable iron clips are bolted to the plates and bear against the flanges of the outside rails.

Re-enforcing Straps.—Wrought iron straps from 1 in. to 2 in. thick are rolled by the steel companies to fit the contour of the rail sections. These make efficient and economical re-enforcing, as an angle bar fit is provided and any wear may be taken up by tightening the bolts. Many of the railways are now using forged knee braces instead of the rolled straps, and where traffic is very heavy it is considered good practice to use them. A pair of forged knee braces are shown in Fig. 4.

Heel Risers.—The ends of the easement rails are planed off to ease the blow from a worn wheel tread. This planing varies from ½ in. in 6 in. to ¾ in. in 20 in. A steel casting or inverted rail heel riser is used in end frogs where the angle is less than 15 deg.

Guard Rail Bend.—This also varies among the railways, but Fig. 5 shows a guard rail bending which has given excellent service.

Bolts and Nut Locks.—The bolts used in a crossing should be made of high grade wrought iron, as the requirements are very severe. Bolts whose diameter is 1⅛ in. to 1¼ in. are used in connection with 85 to 100-lb. rail, and 1-in. bolts are used with rail less than 85 lbs.

Many of the railways now specify that all bolts shall have a drive fit. This is accomplished by clamping the rails, fillers and straps together in proper position and drilling the same in one operation with a multiple spindle drill, the diameter of the drills being less than 1-32 in. larger than the bolt. This is one of the most economical improvements of late years, as the several parts of the crossing are held more securely together, and the crossing as a whole more effectively resists the natural wear and tear.

The old spring nut lock gives good service in keeping the bolts tight. Many of the new nutlocks keep the nut from coming loose, but do not provide for variations in the length of the bolt on account of changes in temperature and the elasticity of the metal.

Bevel Washers and Cast Separator Blocks.—The bevel washers, used in connection with the diagonal bolts as at A Fig. 2, are usually malleable castings, several patterns of which are kept in stock for the various angles. The separator blocks which are placed between the easement and running rails are gray iron castings, a separate pattern of which is required for each section of rail, the hole through the block being large enough to accommodate the largest bolt.

Foot Guards.—Both metal and wooden foot guards are used extensively, most of which are efficient. Fig. 5 shows an application of the Hart wood foot guard.

Gage and Flangeways.—The gage and width of flangeways are increased when the crossing is on a curve whose rate is over 3 or 4 deg. Most of the railways and the manufacturers also have a standard table for these increases. The standard depth of flangeway is 1⅞ in.

Marking Crossings for Identification.—This subject has not received much attention, although there is no extra cost involved, and a simple system of marking would eliminate many delays, especially where a number of crossings of various angles, etc., are kept on hand. One railway assigns a certain series of numbers to each division and a number is given to each crossing which is stamped or prick punched on one guard rail of each frog. The manufacturer's name and the date is also stamped on the guard rail. The numbers are tabulated so that the crossing may be identified at any time.

Last, but not least, is the subject of proper foundation for the support of a crossing, as the life of a crossing materially depends upon this factor. The requirements of an ideal foundation are: A substantial resilient material and good drainage combined with a low cost of maintenance. Gravel is good material, but requires more maintenance to keep the crossing in proper surface than fine crushed rock, which provides the most economical foundation. In the case of a high speed main line crossing it is good practice to place a foot or two of coarse rock under the fine crushed rock which provides good drainage and keeps the ballast in place.

INCREASES IN GROSS EARNINGS.—In the 15 years from 1895 to 1910 the gross earnings of the railways of the principal countries of the world increased by the following percentages: Great Britain, 44 per cent.; France, 49; Austria-Hungary, 100; Germany, 108; Russia, 115; the United States, 142. A large increase in mileage accounts for the chief part of the growth in Russia; the development of coal mining industries, for that in Germany

RAILWAYS IN PORTUGUESE EAST AFRICA.—The Mozambique Company is carrying out vast improvements at Beira harbor, Portuguese East Africa, and when the railway from the port to the Zambesi is opened, there is no doubt that a large amount of additional traffic will go to Beira. The railway in question will connect at the Zambesi with the Shiré Highlands Railway, which is to be extended southwards from Blantyre, its present terminus. In due course the Shiré Highland will be connected with the southern end of Lake Nyassa, and from the northern extremity of that lake a line will doubtless be laid to the southern shore of Lake Tanganyika.

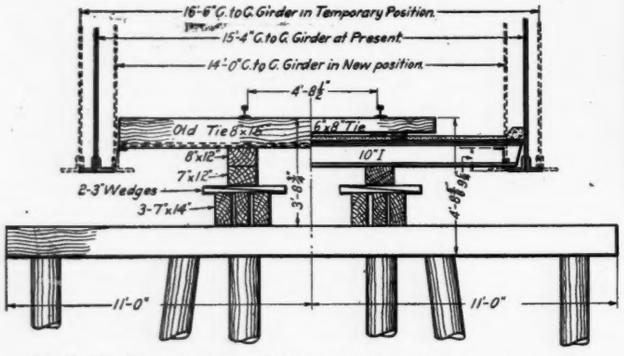
REPLACING A WOODEN BRIDGE FLOOR WITH STEEL UNDER TRAFFIC.*

BY H. S. COWELL,
Seaboard Air Line, Portsmouth, Va.

The Seaboard Air Line crosses over the Atlantic Coast Line near Chester, Va., on a single-track, 90 ft. through plate girder bridge. The track is carried on 8 in. x 15 in. ties resting on shelf angles just above the bottom flange angles of the girders. The girders are 14 ft. centers.

To secure the standard clearance of 14 ft. this bridge had to be widened to 15 ft. 4 in. center to center of girders and suitable flooring put in, good for Coopers E-50 loading. The new floor is made of I-beams with a floor plate riveted to the top flanges, and is built in sections about 7 ft. long, except the sections at each end, which are only 2 ft. long. The first and third I-beams from each end are connected directly to the stiffener angles at those points, and the intermediate beams are connected to the web plates by a pair of angles and strap plates.

The special feature of this job was the method of erection. It was necessary to keep the track open for traffic, as trains cross this bridge about one hour apart. Temporary trestle bents were built under the bridge with caps extending well beyond the present outside edges of the girders. Stringers and



Method of Replacing a Wooden Bridge Floor with Steel.

blocks were placed on these bents and wedged up under the present ties enough to relieve the shelf angles of all load. The lateral bracing and cross struts were then cut out and the girders jacked apart far enough to permit placing the new steel floor in a flat position.

As there is only one track at this point and no sidings near, the use of a wrecking crane for placing the floor sections was not advisable. After anchoring the running rails a short distance from each end of the bridge, to prevent creeping after the track was broken, enough ties and rail were taken up to allow placing as many sections of floor as possible between trains. Each section of floor was pulled out onto the bridge by means of a hoisting engine and a system of blocks and lines, placed at either end of the bridge, and allowed to drop into place on the temporary stringers. As each section was placed, blocks and new roadway ties were laid on it and the rails replaced.

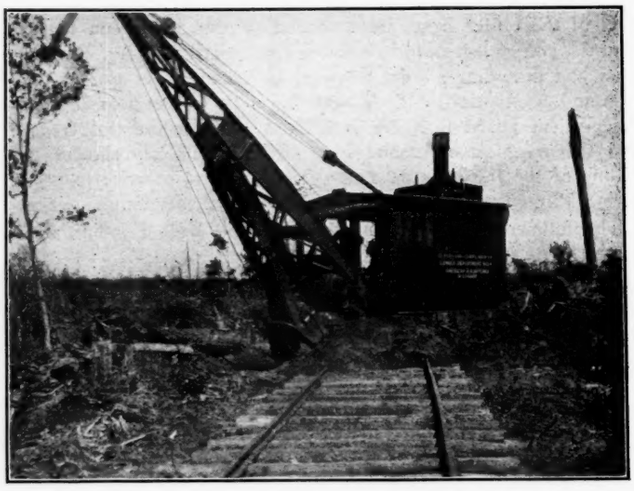
After all the sections were placed they were wedged up from the stringers to their correct position, the girders were pulled into their proper position and the connection holes in the web plates were drilled through the strap plates, making perfect holes. The holes in the stiffeners were drilled with a short ratchet drill. All rivets were then driven.

To make a waterproof floor a thin concrete slab was poured over the floor plate with curbs at each side and end, and thoroughly covered with a waterproof paint. During the laying of this slab the ties were carried on small blocks placed at intervals across the bridge and the concrete was poured around them. After the concrete had set these blocks were shifted over on top of the concrete and all holes filled. The ballast was placed on top of the concrete and all falsework removed.

* Submitted in the contest on Bridge Kinks, which closed June 25, 1912.

GRADING AND TRACKLAYING WITH AN AMERICAN DITCHER.

The lumbering department of the Cleveland Cliffs Iron Company has been using an American Hoist & Derrick Company's railway ditcher with log-loading attachment in the construction of a logging spur from the east branch of the Munising, Marquette & Southeastern Railway. A 50-ton Lima locomotive will be used on this logging spur, so that the standard of track



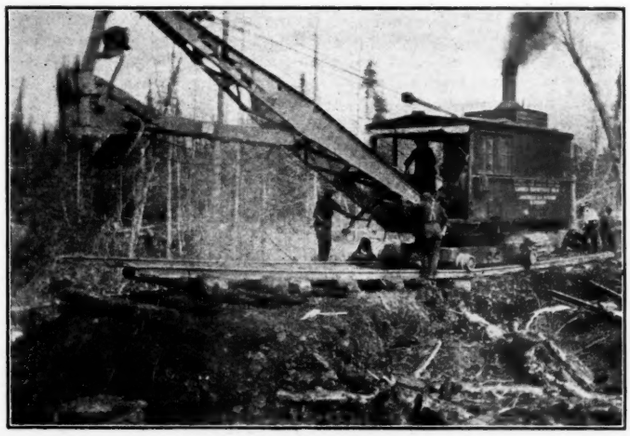
Throwing in Dirt for Ballast on Finished Track.

construction does not have to be equal to that required on a track used by standard road locomotives.

The spur is built across an unbroken country, and it was necessary for the machine to clear, grub, grade, surface and ditch the line. The large trees were cut down ahead of the machine, after which it was found that only about one-fourth as much dynamite was required for grubbing as by the usual methods. The machine operated on short, portable sections of track, being equipped with double flanged wheels of two gages so that the sections of the track could telescope at the junctions. Auxiliary standard gage wheels are also furnished so that the machine could move either on permanent standard gage track

Clearing Logs and Brush from Right of Way.

or on portable track sections of standard gage. When moving forward the machine picked up these track sections from the rear and placed them in front. While standing on one section of track the machine could clear or grade a section far enough in advance to allow the placing ahead of another section. On level ground very rapid progress was made in this manner. In cuts and fills progress was of course slower, but



Making a Small Earth Fill.

the machine was able to handle both classes of work. When a section of track had been cleared the ties and rails were laid by hand and the machine was run back to the starting point and operated as a ditcher, taking material from either side of the track and filling between the rails for ballast. The shovel, ditching and pile-driving attachments could all be used with the same boom, although the equipment included another boom used for log loading. For any of these purposes the machine can be worked on the ground or on top of flat cars, the

Moving Forward a Section of Portable Track.

latter being the usual practice when loading logs. The machine can also be used to some extent for skidding logs. The use of this machine has allowed light logging roads of this kind to be built much more rapidly and at considerable less expense than is possible when all the work is done by hand. The outlay for doing this work by hand has been: Moving dirt, $.20 per yd.; grubbing, $5 per 100 ft.; cutting right of way, $2 per 100 ft.. The cost of doing it with the machine has been as follows:

Labor.		
Machine operator	$3.00	
Fireman	1.50	
Two men on ground ($1.70 each)	3.40	
Section foreman	2.50	
Total		$10.40
Supplies for Machine.		
Hauling water, driver	$1.00	
Team and wagon	3.00	
	$4.00	
Oil	.50	
Coal	1.25	
Total		5.75
Total cost of one day's work		$16.15

The machine has handled 345 yds. in 9 hours, making a unit cost of about $.04½ a yard.

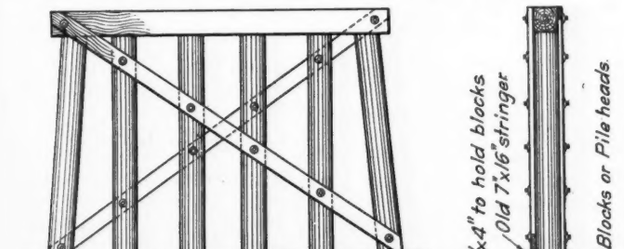
The machine has been used for grubbing and clearing right of way at a saving of over $12 a day.

"DRIVING" PILES.

BY L. C. LAWTON,

Division Engineer, Atchison, Topeka & Santa Fe, Newton, Kan.

On branch lines it is sometimes necessary to maintain trestles in which one or more bents have struck rock or hard shale, and while there may have been some penetration, the piles are broomed, a condition which every train increases, producing the well known "driving" pile. If the traffic is heavy such a trestle calls for monthly inspection and frequent trips of a gang to shim up so as to avoid a broken cap or at least a sag in the surface. This condition probably will not be found on main lines, as masonry piers or arches would be used, and even on secondary lines we are putting in sub-piers of concrete and frame bents anchored by bolts built in the masonry, but where there are hundreds of miles of branch lines on a division, this calls for a capital charge in renewals which is best avoided. Piles



Method of Overcoming "Driving" Piles.

which are "driving" often have enough penetration to keep them in line against a flood that would severely try a frame bent held by bolts. In a few cases of ballast deck trestles we have secured relief by double capping, but not under open decks. Now, when a bent starts to drive we uncover the hard material the full length of the bent and level it as much as possible. Blocks or creosoted pile heads 3 or 4 ft. long are laid lengthwise with the track. On either side of the bent are then laid horizontal sash braces of old stringers or treated material of almost equal section. These are jacked down from the cap and bolted, two bolts in the pile. Should the blocking be in the current of the stream it can be fastened to rock with drift bolts or kept in place by a strip outside of the sash braces. Should any settlement occur in blocking, wedges can be driven under the sash braces and the surface maintained in this way.

General News Section.

The machine shops and store house of the Illinois Central at Jackson, Tenn., were seriously damaged by fire on September 7.

Near Paris, September 17, Georges Legagneux, flying in a Marane monoplane, rose to a height of 18,372 ft., or more than 3½ miles.

The aggregate valuation of railways for taxation in the state of Ohio this year is $632,078,590, an increase of nearly 51 millions over 1911.

Suit has been filed in the United States district court at Indianapolis against the Chicago & South Bend for a violation of the safety appliance law.

Suit has been filed in the United States District Court at Hannibal, Mo., against the Chicago, Burlington & Quincy for a violation of the hours of service law.

The Arkansas State Tax Commission announces that the aggregate valuation of the railways of the state is $81,781,055. Four years ago the total was about 51 millions.

The Chicago Great Western has installed for trial an automatic train control device, known as the Gallos automatic train stop. Two block sections, each approximately one mile in length, have been equipped on the Sycamore-DeKalb branch.

James J. Hill was tendered a complimentary banquet by citizens of St. Paul on September 16, on the occasion of his seventy-fourth birthday, which was attended by 1,200 persons. Addresses were made by Governor Eberhardt of Minnesota, the mayor of St. Paul and others.

The Chicago Harbor and Subway Commission has submitted to the local Transportation-Committee of the City Council recommendations for five subway routes, extending into the outlying sections of the city, amounting to 56 miles of subway, or 131 miles of track, at an estimated cost of $96,257,000 for construction and $34,844,000 for equipment.

The grand jury at Corning, N. Y., September 17, reporting on the disastrous collision near that place on July 4, says that no criminal blame attaches to any person. The engineman of train No. 11 and the flagman of the preceding train, who were arrested and who have been held under bail bonds since the coroner's inquest, will now be discharged.

Near Stevenson, Ala., September 17, the mail car of an eastbound passenger train of the Southern Railway was robbed of its registered letters, the four mail clerks being intimidated by two bandits with revolvers. The robbers stopped the train in a lonely spot; and did their work so quickly that few of the passengers knew what was going on until the train reached the next station.

Oscar S. Straus, a member of the arbitration board which is considering the wages of locomotive enginemen on the eastern railways, has resigned his position as chairman of that board, and Mr. Van Hise has been elected chairman. Mr. Straus is a candidate for governor of New York, and his party managers have called upon him to take up the work of the campaign. Mr. Straus will remain a member of the board. Members of the board give no information as to the time when their report will be out.

The Pennsylvania has issued an order limiting the speed of all passenger trains at all times to 70 miles an hour. This order applies to all of the lines both east and west of Pittsburgh. Very few schedules require speeds above the rate named, and the order, therefore, will not materially affect trains except when they are behind time. The speed-limit post, which was recently adopted, and which was described in the *Railway Age Gazette*, August 30, page 385, has to do only with speeds of 45 miles an hour and less. The carrying out of the present order, therefore, depends on the care of the engineman.

One hundred business men of Pittsburgh, Pa., are making a trip of 5,000 miles through 18 states for the purpose of advertising their city. They go by a special train which is called the "Made-in-Pittsburgh" train, substantially every part of the engine and of the cars being marked with plates showing the names of the makers. The train consists of 12 cars. There are four steel baggage cars 60 ft. long, in which are carried motion picture shows and other exhibits designed to advertise the industrial enterprises of Pittsburgh. The excursion is managed by the Pittsburgh Chamber of Commerce, and the first city visited was Toledo, Ohio.

At an exhibition in Toronto, the varied effects that can be produced with electric lights in signs, energized intermittently, have been utilized in a map to simulate the movement of a railway train. The map is in the display made by the Canadian Government at the Canadian National Exhibition. The routes traversed by the Intercolonial and the Prince Edward Island Railways, and the train service given from Montreal to the chief centers of the Maritime Provinces, are ingeniously shown on a sixty-foot map of the territory served; and the railway routes are outlined in red electric lamps. Over this red route there flickers a dark shadow, giving an impression of a moving train. The names of the principal cities and points of interest flash successively in bright lights.

President Fairfax Harrison, of the Chicago, Indianapolis & Louisville, informs us that an item published in these columns on August 30 regarding the running of a pay car over this line was entirely misleading. The item indicated that the practice of paying employees by checks has been discontinued because of the discovery that some of the pay rolls have been found to be carrying the names of former employees, now dead. The Monon has not discontinued paying its employees by check. Its practise is to have the pay checks distributed by station agents, but it occasionally operates a pay car to enable the treasurer to make personal distribution of pay checks direct to employees. This is intended to and does serve as a check on the employees' pay rolls, but the newspaper story that the Monon's pay rolls were found to be padded with the names of dead men is without foundation.

The American Society of Mechanical Engineers has received an invitation from the council of the Verein Deutscher Ingenieure to hold a joint meeting with the council at Leipzig, Germany, June 23-25, 1913. The meeting is to be followed by an official tour of the industrial centers in Germany and will include a trip on the Rhine and special opportunities for a comprehensive study of the great Museum of the Technical Arts and Industries at Munich. Many establishments will be thrown open that could not be visited under other auspices, and extraordinary and unique opportunities will be afforded to the visitors to familiarize themselves with the latest developments in the various industries. In addition to these visits, which will be a part of the official tour, the society is in receipt of invitations from individual firms throughout Germany. It is hoped that a party may be arranged sufficiently large to warrant chartering an entire steamer.

The railways of the southeastern states, following extended conferences at Washington, have agreed with the representatives of their conductors and trainmen to refer pending questions of wages to Messrs. Knapp and Neill under the federal law providing for conciliation in such cases.

The representatives of telegraphers, who are seeking increased pay on the Pennsylvania Railroad, last week carried their case to Judge Knapp and Commissioner Neill, the government conciliators at Washington; and Messrs. Knapp and Neill wrote to the railroad company requesting information as to the nature of the controversy. General Manager S. C. Long replied that the company was not ready to accept the good offices of the government representatives, for the reason that the general manager is already negotiating with a committee representing telegraphers. There are two organizations of telegraphers on the road and the company is not disposed to treat with two committees representing the same class of employees. Mr. Long quoted at length from a letter written to the government officers by his predecessor, Mr. Atterbury, three years ago, setting forth in detail the relations then existing between the company and its telegraphers; and he stated that the conditions had not materially changed since that time.

Motor Cars for Lehigh Valley Trackmen.

The Lehigh Valley now has about 25 motor cars in use for the transportation of track repair gangs to and from their work, the first of these having been put in service about six months ago; and additional cars have been ordered, so that soon the total number in service will be 50 or more. These cars, introduced at first on lines of light traffic, where the length of some of the sections could be increased, thereby enhancing the efficiency of the service, have been found so satisfactory that considerable numbers are now used on the main line and it is the intention of the officers of the road to introduce them generally. Most of the cars are of a size to carry an ordinary gang of section laborers, say eight or ten men; but cars have been provided also for the bridge repairers, the painters and the telegraph construction gangs, and those furnished for this service carry 18 men. The economy to be had from the use of motor cars in this service, as compared with hand cars, has been frequently noted in these columns, one of the latest accounts being that published March 15 last, page 503.

Co-operative Education on the Illinois Central.

In an item on this subject in the *Railway Age Gazette* of September 13, the statement was made that the boys who are to take the apprenticeship course will spend alternate days in high school and in the shops. This was not correct. They will spend the morning of one day in the shops and the afternoon in school, and the next day the morning in school and the afternoon in the shops. They will be given one year's credit on their apprenticeship course for the one year's manual training that they will have had in high school, but as the actual time they will spend in the shop while they are taking their high school course will be but something over two years, they will be required to spend about a year in the shops after they get out of high school. During their first year in the shops they will be paid 12 cents an hour; during the first six months of the second year, 13 cents; during the next six months, 14 cents, and their compensation will be increased one cent an hour for each subsequent six months until it reaches 20 cents an hour. A plan similar to that adopted at McComb has just been decided on at Waterloo, Iowa, where there will be 20 of the co-operative apprentices to start, a number which it is hoped to increase to 30. Another departure that is being made in the training of apprentices on the Illinois Central is that the boys are started with reading, drawing and mathematics, and work up to mechanical drawing, the time that it takes a boy to get to mechanical drawing depending on his ability and efforts. The plan for the co-operative high school and apprenticeship course is being worked out by Edgar V. Lea, general inspector of shop practice, and D. C. Buell, chief of the educational bureau of the Illinois Central.

Steel Corporation's Unfilled Tonnage.

The report of the United States Steel Corporation shows that the unfilled tonnage on August 31 was 6,163,375 tons. This is an increase of more than 206,000 tons over the previous month, when it was 5,957,079 tons. On August 31, 1911, the unfilled tonnage was 3,695,985 tons. The unfilled tonnage on August 31, 1912, was greater than it has been at any time since September 30, 1907, when it was 6,425,008 tons, and is only 2,200,000 tons below the high record of 8,489,000 tons reported on December 31, 1906.

Disastrous Flood at Rockdale, Pa.

The flood in Western Pennsylvania on September 1, reported in our last issue, was so serious as to enforce a suspension of through traffic on the Wabash-Pittsburgh Terminal Railway for a whole week. The damage suffered by this company, including losses of freight, aggregated $100,000 instead of the larger sum at first reported. The trouble was due to a number of cloudbursts in the upper hills north of Avella station, which occurred about midnight, Sunday, September 1. At various points between Avella, Pa., and Rockdale, W. Va., the roadbed was completely destroyed, fills being washed out to a depth of 25 to 30 feet, where heretofore no trouble whatever had been experienced since the road was built. One concrete abutment was undermined and broken, and one heavy stone abutment seriously damaged, the wing wall being entirely washed away. Three loaded coal cars standing on mine tracks were swept down across the main line and carried several hundred feet away. All wagon bridges for several miles were demolished, and several persons were drowned. Previous to midnight it had not rained at Avella or any nearby point, and there was absolutely no opportunity for preparation. At the first intimation of trouble all trains were stopped except fast freight train No. 82, eastbound, which could not be reached on account of all telegraph and telephone wires being down. The engine and eight loaded cars of this train plunged into Cross Creek after rounding a sharp curve about a mile east of Rockdale, which was the first point they encountered the stream. The water having reached a stage of about 40 ft., softened the embankment to such an extent that the track was probably undermined when the train reached there. The engineman got out alive, but the fireman and one brakeman were drowned.

A Revised Flagging Rule.

The following six paragraphs contain a revision of standard code rule No. 99, which has been issued by the Delaware, Lackawanna & Western, to go into effect this week:

Rule 99. When a train stops or is delayed, under circumstances in which it may be overtaken by another train, the flagman must go back immediately with stop signals a sufficient distance to insure full protection, and place one torpedo on the rail. When recalled he may return to the train, first removing the torpedo, except in foggy or stormy weather or should other conditions require it, when he will place an additional torpedo on the rail not more than 200 feet from the first one. (Torpedoes should be placed not less than 12 feet from rail joints.)

99 (a). The front of a train must be protected in the same way, when necessary, by the baggageman, if one present, otherwise by the head trainman, and in the absence of both, by the fireman.

99 (b). When necessary, red fusees must be used in addition to other stop signals to insure stopping trains.

99 (c). At night, and in fog or severe storm, day or night, flagman will, when recalled, place one lighted green fusee upright outside the rail on engineer's side, in addition to placing torpedoes.

99 (d). Green fusees, as may be necessary, must be dropped off at intervals to insure protection.

99 (e). In stormy or foggy weather, the flagman must not be recalled when a first-class train is due.

99 (f). Torpedoes exploded by hand, velocipede or gasolene cars must be at once replaced.

The Nation's Business.

This is the name of a new publication which the newly formed Chamber of Commerce of the United States is getting out. It is in form like a daily newspaper. The first issue has eight pages. The object of the paper is described as follows: "The *Nation's Business* is the organ of the Chamber of Commerce of the United States of America and is prepared for the use of editorial writers, commercial organizations and constituent members.

"The *Nation's Business* will gather for the use of newspapers and organizations current information regarding the development of the nation. Every reader is, therefore, invited to be a correspondent regarding local matters in the financial, agricultural, mining, manufacturing, transportation, distribution, and educational fields; also in the professions, the government and altruism.

"The names of those other than editors, organizations, or constituents who desire to receive the *Nation's Business* regularly will be registered at the rate of $1 for 20 issues."

The editor of the *Nation's Business* is E. Grosvenor Dawe.

Railway Regulation Run Wild.

The limit appears to have been reached in official attempts to regulate the railways in an order issued by the California commission, practically assuming control of the time tables of passenger trains. The order requires all the railways operating in California to file with the commission by October 1 three copies of their current working time tables, used for the gov-

ernment of their employees, and that copies of all future issues shall be filed with the commission ten days before they become effective.

It was also ordered that each railway shall after October 1 submit to the commission for its approval all proposed changes in schedules of regular passenger trains; and whenever a change is made in the time of the arrival or departure of a regular passenger train, such information shall be posted in a notice in two conspicuous places in the waiting room of each station affected, ten days before the change becomes effective.—*Railway Record.*

Disastrous Derailment at Widnes, England.

Press despatches of September 17 report the derailment of an express train of the London & Northwestern on that day at Ditton Junction, near Widnes, Lancashire, in which 16 persons were killed and 60 injured. The derailment appears to have occurred at a switch. The train was running at high speed and the engine was thrown against the wall of a bridge, while the first three or four coaches were dashed against the platform of the station and were completely broken up. The cars soon took fire from the locomotive and many of the victims were burned.

Safety Rally at Kansas City.

For the purpose of arousing greater personal interest in accident prevention among railway employees generally, and to popularize the "safety first" idea, plans are being made for a mass meeting of employees of all the roads entering Kansas City, to be held at Convention Hall in that city on Saturday evening, October 19. It was originally proposed to hold the meeting on September 14, but the date was subsequently postponed. It is the intention of the committee in charge to hold on this occasion the largest and most enthusiastic meeting in the interest of the safety of railway employees ever held in the United States. The meeting was proposed to the general managers of the various lines by W. T. Tyler, general manager of the Frisco lines, and C. W. Kouns, general manager of the Atchison, Topeka & Santa Fe, and several meetings of the representatives of the different roads have been held for the purpose of making the arrangements. It is estimated that from 3,000 to 3,500 employees residing in Kansas City, together with members of their families, will attend, and the Santa Fe is planning to run excursions to Kansas City for the occasion from several places where a large number of men are employed. The meeting will be widely advertised by posters placed in the shops, yards and roundhouses.

C. W. Kouns will preside at the meeting, and addresses will be made by General Manager Tyler of the Frisco, and R. C. Richards, general claim agent and chairman of the central safety committee of the Chicago & North Western. It is also proposed to have employees of different roads give three to five minute talks on their ideas of the effectiveness of personal injury reduction by the individual efforts of the employees in co-operation with the railways. C. W. Egan, general claim agent of the Baltimore & Ohio, and L. F. Shedd, general safety supervisor of the Chicago, Rock Island & Pacific, will also exhibit a large number of moving pictures, illustrating the safe and unsafe ways of doing various kinds of railway work.

American Railway Master Mechanics' Association.

The committees of the American Railway Master Mechanics' Association for the 1913 convention are as follows:

STANDING COMMITTEES.

Revision of Standards:

W. E. Dunham (C. & N. W.), chairman; A. R. Ayers (L. S. & M. S.), M. H. Haig (A. T. & S. F.).

Mechanical Stokers:

T. Rumney (C. R. I. & P.), chairman; J. A. Carney (C. B. & Q.); Geo. Hodgins, New York; Alex. Kearney (N. & W.); J. M. James (Penna. R. R.).

SPECIAL COMMITTEES.

Specifications for Cast-steel Locomotive Frames:

C. B. Young (C. B. & Q.), chairman; E. W. Pratt (C. & N. W.); R. K. Reading (Penna. R. R.); O. C. Cromwell (B. & O.); C. E. Fuller (U. P.); L. R. Pomeroy, New York.

Main and Side Rods:

W. F. Kiesel, Jr. (Penna. R. R.), chairman; H. Bartlett (B. & M.); G. Lanza (Mass. Institute of Technology), Boston, Mass.; H. B. Hunt (American Locomotive Co.), Chicago; W. E. Dunham (C. & N. W.).

Safety Appliances:

D. F. Crawford (Penna. Lines West), chairman; M. K. Barnum (I. C.); C. B. Young (C. B. & Q.).

Design, Construction and Inspection of Locomotive Boilers:

D. R. MacBain (L. S. & M. S.), chairman; C. E. Chambers (C. R. R. of N. J.); T. W. Demarest (Penna. Lines West); F. H. Clark (B. & O.); R. E. Smith (A. C. L.); E. W. Pratt (C. & N. W.); J. Snowden Bell, New York.

Steel Tires:

L. R. Johnson (C. P.), chairman; J. R. Onderdonk (B. & O.); R. B. Kendig (N. Y. C. L.); R. L. Ettenger (Southern Ry.); L. H. Turner (P. & L. E.).

Minimum Requirements for Headlights:

D. F. Crawford (Penna. Lines West), chairman; A. R. Ayers (L. S. & M. S.); C. H. Rae (L. & N.); F. A. Torrey (C. B. & Q.); Robert Quayle (C. & N. W.).

Standardization of Tinware:

A. J. Poole (S. A. L.), chairman; M. D. Franey (L. S. & M. S.); J. C. Mengel (Penna. R. R.).

Superheater Locomotives:

J. T. Wallis (Penna. R. R.), chairman; C. H. Hogan (N. Y. C. & H. R.); R. W. Bell (I. C.); Thos. Roope (C. B. & Q.); W. J. Tollerton (C. R. I. & P.); H. H. Vaughan (C. P.); J. R. Gould (C. & O.).

Subjects:

G. W. Wildin (N. Y. N. H. & H.), chairman; A. W. Gibbs (Penna. R. R.); C. E. Chambers (C. R. R. of N. J.).

Specifications for Materials Used in Locomotive Construction:

H. T. Bentley (C. & N. W.), chairman; H. E. Smith (L. S. & M. S.); Frank Zeleny (C. B. & Q.); A. G. Trumbull (Erie); W. C. A. Henry (Penna. Lines West).

Use of Special Alloy Steels and Heat-treated Steel in Locomotive Construction:

C. D. Young (Penna. R. R.), chairman; Henry Bartlett (B. & M.); S. M. Vauclain, Baldwin Locomotive Works, Philadelphia, Pa.; H. B. Hunt, American Locomotive Company, Chicago; J. C. Little (C. & N. W.).

Smoke Prevention:

E. W. Pratt (C. & N. W.), chairman; J. F. De Voy (C. M. & St. P.); W. C. Hayes (Erie); T. R. Cook (Penna. Lines West); M. K. Barnum (I. C.).

Engine-tender Wheels:

William Garstang (C. C. C. & St. L.), chairman; W. C. A. Henry (Penna Lines West); A. E. Manchester (C. M. & St. P.); R. L. Ettenger (Southern Ry.); J. A. Pilcher (N. & W.); O. C. Cromwell (B. & O.).

Arrangements:

D. F. Crawford (Penna. Lines West).

INDIVIDUAL PAPERS.

Tests of Superheater Locomotives, by Dean C. H. Benjamin, Purdue University, Lafayette, Ind.

Three Cylinder Locomotives, by J. Snowden Bell, New York.

Railway Signal Association.

The seventeenth annual convention of the Railway Signal Association will be held at Quebec, October 8-9-10, as heretofore announced. The headquarters will be at Chateau Frontenac. The reports to be heard on the first day are those of committees 2, 3, 4, 5 and 8, and of the special committee on Storage Battery. On Wednesday the reports presented will be those of committees 1, 6 and 7, with no session in the afternoon. On Thursday the reports are those on Wires and Cables, on Con-

tracts, and on Method of Recording Signal Failures; and final adjournment is scheduled for 12:45 p. m. on that day.

Committee No. 1 will present for approval revised statements of signal fundamentals, scheme 1, scheme 2 and scheme 3. It will also present some information on flash lights for railway signals.

Committee No. 2 will present revised specifications for sections 100, 101 and 102 of the mechanical interlocking specifications; specifications for an electric bolt lock, with a drawing of a circuit; also data concerning plants with power signals; also eight drawings of details of tower leadouts.

Committee No. 2 (power interlocking) will present specifications for mechanical and electric releases, for vitrified clay conduit and for fiber conduit; also data on protection to drawbridges and on voltage ranges for electrical work. This committee will present a large number of drawings showing typical circuits for electric interlocking; nine showing schemes of the American Railway Signal Company; ten showing those of the Federal Signal Company; three of the Union Switch & Signal Company, and one (operating switchboard) of the General Railway Signal Company.

Committee No. 4 (automatic block signaling) will present specifications for relays, for a battery cell, for a channel pin, for crossarms, for glass insulators, for galvanizing and for cedar poles. Accompanying these specifications are 11 drawings. The committee will also report on the use of rubber-covered, soft-drawn copper wire; on specifications for blue vitriol and for zincs; for gravity battery jars, and for coppers. The committee will also discuss number plates, to be used on automatic block signal posts.

Committee No. 5 (manual block signaling) will submit a report describing the manual and the controlled manual systems including the staff system; with seven diagrams. The report includes data as to costs.

Committee No. 6 (standard designs) will submit 35 drawings which it desires to have submitted to letter ballot for adoption. These include a bracket post, spectacles, a dwarf signal, and numerous details of ground apparatus.

Committee No. 7 will present for approval 300 definitions of words, terms and phrases.

Committee No. 8 will present historical facts concerning the use of alternating current in railway signaling throughout the country, as well as some examples from Europe. This committee also will propose to submit to letter ballot specifications and requisites of apparatus for A C automatic block signaling, for transformers and for impedance bonds.

Committee No. 9 will propose changes in the specifications for wires and cables.

The committee on Contracts will present some forms of agreement which have been drawn up for consideration.

The committee on Method of Recording Signal Performance will re-submit the seven forms which were considered a year ago, but it concluded that it would not be desirable to try to secure approval of rigid universal standards at the present time.

The committee on Storage Battery will present specifications for a lead type storage battery for interlocking.

American Association of General Passenger & Ticket Agents.

The convention of the American Association of General Passenger & Ticket Agents was held in Seattle, Wash., from September 12 to 13. President Cairns presided over the meeting. The docket comprised many subjects, of which the more interesting are as follows: Desirability of Uniform Practice in Conduct of Passenger Traffic. The Printing of Folders and Other Advertising Matter and Economical Distribution of Same. Compilation of Joint Passenger Tariffs. The Publication of an Official Manual of Coupon Ticket Agents. General Promotion of "See America First" Movement. The principal address before the convention was on Railways and the Public, by William Sproule, president of the Southern Pacific. This address is abstracted on page 509.

Interesting papers were also presented from the American Association of Railway Accounting Officers, the American Association of General Baggage Agents, the American Association of Passenger Agents, the International Association of Ticket Agents and the Canadian Ticket Agents' Association.

R. H. Wallace, general passenger agent of the Erie, was elected president for the ensuing year, succeeding C. A. Cairns, and W. J. Craig, passenger traffic manager of the Atlantic Coast Line, was made vice-president, succeeding Mr. Wallace.

International Rubber Conference.

The third International Rubber Conference will be held at the new Grand Central Palace, New York, September 24-30. On the morning of September 25 a paper will be presented on Physical Methods of Tetsing Rubber and Rubber Products, by A. L. Wormeley, Bureau of Standards, Washington, D. C. On the morning of September 26 there will be a topical discussion on Specifications of Mechanical Rubber Goods for Railways, including as sub-topics: Air brake hose, railway steam hose, fire hose, packings, etc. On the morning of September 27 there will be a preliminary report of the activity by the railway committee on Standard Methods of Testing Rubber Products. Frederic Dannerth is secretary.

Association of Railway Electrical Engineers.

The fifth annual convention of the Association of Railway Electrical Engineers will be held in the Auditorium Hotel, Chicago, October 21-25. The hall, occupying the ninth floor of the hotel, has been reserved for the exhibit. The entertainment program includes an informal dance, an automobile tour of Chicago's parks, a theater party and an annual banquet.

Railroad Y. M. C. A. Conference.

The fourteenth annual conference of the Railroad Y. M. C. A. will be held at Orchestra Hall, Chicago, October 3 to 6. H. U. Mudge, president of the Chicago, Rock Island & Pacific, has accepted the chairmanship of the committee in charge of the local management of the conference.

Western Railway Club.

The regular monthly meeting of the Western Railway Club was held in the rooms of the Permanent Exhibit of Railway Supplies, in the Karpen building, Chicago, on September 17. George W. Cravens, presented a paper on "The Electrical Equipment of Railway Shops."

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass. Convention, May, 1913, St. Louis, Mo.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Boston, Mass.

AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—W. C. Hope, New York.

AMERICAN ASSOCIATION OF FREIGHT AGENTS.—R. O. Wells, East St. Louis, Ill.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—W. C. Cooder, Carew building, Cincinnati, Ohio; 3d Friday of March and September.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York. Convention, October 7-11, Chicago.

AMERICAN ELECTRICAL RAILWAY MANUFACTURERS' ASSOC.—George Keegan, 165 Broadway, New York. Meetings with Am. Elec. Ry. Assoc.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 75 Church St., New York; annual, November 20, 1912, Chicago.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago. Convention, 3d week in Oct., Baltimore, Md.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, 900 S. Michigan Ave., Chicago. Convention, March 18-20, 1913, Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOC.—J. W. Taylor, Old Colony building, Chicago.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—M. H. Bray, N. Y. N. H. & H., New Haven, Conn.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; annual, June, 1913.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—J. R. Wemlinger, 13 Park Row, New York; 2d Tuesday of each month, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.

AMERICAN WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, B. & O., Baltimore, Md. Convention 3d week in January, 1913, Chicago.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago; annual, October 21-25, Chicago.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 112 West Adams St., Chicago; annual, May 20, 1913, St. Louis, Mo.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 75 Church St., New York. Meeting Dec. 10-11, 1912, New Orleans, La.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 2d Tuesday in month, except June, July and Aug., Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—L. S. Pomeroy, Old State Capitol building, St. Paul, Minn.; 2d Monday, except June, July, August and September, St. Paul.

ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Richmond, Va.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—E. S. Koller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.

INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, 11, rue de Louvain, Brussels, Belgium. Convention, 1915, Berlin.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. G. Hall, 922 McCormick building, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—L. H. Bryan, Brown Marx building, Birmingham, Ala.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio.

MAINTENANCE OF WAY MASTER PAINTERS' ASSOCIATION OF THE UNITED STATES AND CANADA.—W. G. Wilson, Lehigh Valley, Easton, Pa. Convention, November 19-21, Chicago.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York. Convention, May, 1913, Chicago.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOC. OF U. S. AND CANADA.—A. P. Dane, B. & M., Reading, Mass.

NATIONAL RAILWAY APPLIANCES ASSOC.—Bruce V. Crandall, 537 So. Dearborn St., Chicago. Meetings with Am. Ry. Eng. Assoc.

NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

NORTHERN RAILROAD CLUB.—C. L. Kennedy, C. M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.

PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotchford, Union Station, Peoria, Ill.; 2d. Tuesday.

RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

RAILWAY BUSINESS ASSOCIATION.—Frank W. Noxon, 2 Rector St., New York; annual, November 20, 1912, New York.

RAILWAY CLUB OF PITTSBURGH.—J. B. Anderson, Penna. R. R., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

RAILWAY ELECTRICAL SUPPLY MANUFACTURERS' ASSOC.—J. Scribner, 1021 Monadnock Block, Chicago. Meetings with Assoc. Ry. Elec. Engrs.

RAILWAY GARDENING ASSOCIATION.—J. S. Butterfield, Lee's Summit, Mo.

RAILWAY DEVELOPMENT ASSOCIATION.—W. Nicholson, Kansas City Southern, Kansas City, Mo. Next meeting, Nov. 17, 1912, Cincinnati, Ohio.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa. Convention, Oct. 8-11, Quebec.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio.

RAILWAY SUPPLY MANUFACTURERS' ASSOC.—J. D. Conway, 2135 Oliver bldg., Pittsburgh, Pa. Meetings with M. M. and M. C. B. assocs.

RAILWAY TEL. AND TEL. APPLIANCE ASSOC.—W. E. Harkness, 284 Pearl St., New York. Meetings with Assoc. of Ry. Teleg. Sups.

RICHMOND RAILROAD CLUB.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—L. C. Ryan, C. & N. W., Sterling, Ill.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

SIGNAL APPLIANCE ASSOCIATION.—F. W. Edmonds, 3868 Park Ave., New York. Meetings with annual convention Railway Signal Association.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Niquist, La Salle St. Station, Chicago.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.; annual, Oct. 17, Atlanta, Ga.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

TOLEDO TRANSPORTATION CLUB.—J. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

TRAFFIC CLUB OF CHICAGO.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

TRAFFIC CLUB OF PITTSBURGH.—D. L. Wells, Erie, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

TRAFFIC CLUB OF ST. LOUIS.—A. F. Versen, Mercantile Library building, St. Louis, Mo. Annual meeting in November. Noonday meetings October to May.

TRAIN DESPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago.

TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Monday in month, except July and August, Chicago.

Traffic News.

The Union Pacific has engaged a potato expert, E. H. Grubb, who will spend his time for the next year in "missionary work" among the potato growers in the territory along the line of the Union Pacific and the Oregon Short Line.

On Monday, September 9, there were loaded locally on the tracks of the Missouri-Pacific-Iron Mountain system 3,999 cars of revenue freight, the largest record ever made in a single day on that system. The best previous record was 3,972 cars loaded on October 25, 1911.

The Southern Railway has arranged weekly schedules of fast freight trains for live stock, to be run every Thursday until November 28, for the benefit of shippers in eastern Tennessee and western North Carolina, who send cattle to the Virginia feeding grounds and to Eastern markets.

The Merchants Despatch Transportation Company announces that on its refrigerator cars when off the New York Central lines —that is, when no part of the journey is over one of these lines— the initial road will be called upon, after October 1, to pay $5 per car per trip, in addition to the usual rental charge.

The Southern Railway reports that the number of carloads of peaches shipped out of the Georgia peach orchards this year has been 5,334, of which 4,665 went to eastern markets and were moved in solid trainloads from Atlanta to Washington. The number of cars shipped last year was only 826; the year before it was 4,820. The total movement of peaches over all lines of the Southern Railway this year has been 7,139 cars.

The Erie has sent to consignors and consignees postal cards bearing in large red letters a number of suggestions by which the greatest efficiency can be obtained from the available car supply by co-operation between the railways and the shippers. The suggestions are headed, "Keep the Cars Moving," and some of those specially emphasized are, "Somebody Needs the Empty!" "It May Be Your Turn Next!" "Cars Are Built for Transportation, Not for Storage!"

At a conference of railway officers and representatives of shippers, called by the Traffic Bureau of the St. Louis Merchants' Exchange on September 11, a committee was appointed to seek a change in the American Railway Association rule, which became effective on September 1, by which foreign cars unloaded at elevators may not be reloaded except in direction of home. The rule has caused a number of complaints by shippers as being responsible for serious congestion in the St. Louis grain market.

J. M. Belleville, president of the National Industrial Traffic League, has written a letter to W. A. Garrett, chairman of the General Managers' Association of Chicago, protesting that the railways are doing the manufacturers an injustice in storing empty freight cars in the grain-growing sections of the west and northwest preparatory to the movement of the crops. According to Mr. Belleville this situation constitutes "a plain case of the railways needlessly and wrongfully reducing the available supply of cars."

Steamboats of the Central of New Jersey, running in New York bay from Manhattan to Atlantic Highlands, about 20 miles, have been taken off for the season. The withdrawal of the boats at this time is not due to the coolness of the weather but to the requirements of the government in regard to the capacity of the life boats that must be carried, which was increased on the 15th of September from 30 per cent. of the passengers carried to 50 per cent.; and on October 1 it must be 100 per cent. Other boats in New York harbor and Long Island sound have been taken off for the same reason.

The chief forester of the Agricultural Department is in California closing the bargain under which a lumber company buys from the government 800,000,000 feet of timber. In accordance with its usual rule, the government will reserve about one-third of the trees on the tracts which are to be cut over. This timber is in the national forest in the Sierra Nevada mountains, and to get it to market will necessitate the construction of 70 miles of railway. The purchasing company has 22 years in which to take off the lumber and two years additional in which to prepare

its plant. The forester says that the timber of merchantable size now standing on government lands aggregates nearly 600,000,000,000 feet; but much the larger part of this is too far from market to have much present value. The California contract provides for the readjustment of the stumpage prices every five years, according to the variations which may take place in the price of manufactured lumber.

Illinois Commission Urges Co-operation by Shippers to Relieve Car Shortage.

The Illinois Railway Commission, which recently addressed a letter to the railways of the state urging them to do everything possible to get their cars and engines in shape to handle a large traffic this fall, has issued another circular letter, addressed to shippers, asking their fullest co-operation with the railways. "Unless the most thorough co-operation is practised by both the railway companies and the shippers," the commission says, "it will be extremely difficult to move the present grain crop promptly to the market. To that end we suggest that shippers order no more cars than they are able to load quickly, and that when received they load them promptly. Merchants using cars for any purposes that could be used for the shipment of grain we earnestly request to unload their goods as rapidly as possible in order that the cars may be reloaded by grain shippers at the same point. We urge that cars be loaded as soon as placed, and that they be loaded as near their full capacity as possible; and if you receive loaded cars, unload them promptly, thus making an empty car. The commission wants to emphasize at this time that cars are made for transportation of products and not for storage or warehouse purposes, and if your neighbor is holding cars for storage purposes that could be unloaded, he deprives you of an empty car that you need. We have asked for, and believe we are receiving, the co-operation of the railways. We now ask the hearty co-operation of shippers and all persons using cars to the same end, and with proper system, promptness, and a little patience and all working together, we believe the crop can be moved, large as it is, with less congestion and more promptly than at any time in the history of the state."

General Crop Conditions.

The department of agriculture estimates crop conditions to be as follows:

FOR THE UNITED STATES.

Crops.	Condition, September 1.			Aug. 1,	Acreage, 1912.	
	1912.	1911.	Ten-yr. av.	1912.	P. C. of 1911.	Acres.
Corn	82.1	70.3	81.1	80.0	102.2	108,110,000
Winter wheat	....	....	....	....	88.3	25,744,000
Spring wheat	*a*90.8	*a*56.7	*a*76.5	90.4	94.2	19,201,000
All wheat	*a*84.3	*a*69.0	*a*78.8	....	90.7	44,945,000
Oats	*a*92.3	*a*64.5	*a*78.8	90.3	100.2	37,844,000
Barley	*a*88.9	*a*65.5	*a*81.2	89.1	99.4	7,574,000
Rye	....	....	....	....	98.6	2,097,000
Buckwheat	91.6	83.8	86.4	88.4	100.2	835,000
White potatoes	87.2	59.8	79.6	87.8	101.9	3,689,000
Tobacco	81.1	71.1	81.6	82.8	117.9	1,194,200
Flax	86.3	68.4	*b*80.3	87.5	108.5	2,992,000
Rice	88.8	87.2	87.9	86.3	102.0	710,100
Hay, all tame	....	....	....	91.0	102.0	49,209,000
Apples	67.9	56.2	53.8	65.8	.....	.....

a Condition at time of harvest. *b* Nine-year average.

The yields indicated by the condition of crops on September 1, 1912, and final yields in preceding years, for comparison follow:

Crops.	Yield per acre.			Total production in millions of bushels.		
	1912*a*.	1911. Final.	1906-1910 av.	1912*a*.	1911. Final.	1910. Final.
	Bus.	Bus.	Bus.			
Corn	27.7	23.9	27.1	2,995	2,531	2,886
Winter wheat	*b*15.1	14.8	15.5	*b*390	430	434
Spring wheat	15.6	9.4	13.4	300	191	201
All wheat	15.4	12.5	14.6	690	621	635
Oats	34.1	24.4	28.4	1,290	922	1,186
Barley	27.6	21.0	24.8	209	160	174
Rye	*b*16.9	15.6	16.3	*b*35	33	35
Buckwheat	21.3	21.1	19.5	18	18	18
White potatoes	108.0	80.9	96.8	398	293	349
Tobacco, lbs.	817.1	893.7	828.0	976	905	1,103
Flax	*c*9.7	7.0	8.7	29	19	13
Rice	32.7	32.9	32.4	23	23	25
Hay, all tame, tons	*b*1.47	1.14	1.42	*b*72	55	69

a Interpreted from condition reports. *b* Preliminary estimate. *c* Based on average for 1905-1909.

Quality of the hay crop is 92.1, against 90.3 last year and a ten-year average of 91.0.

Details for important crops in principal states follow:

SPRING WHEAT.

States.	Per cent. of U. S. acreage in State.	Condition at time of harvest.			Aug. 1,
		1912.	1911.	10-yr. av.	1912.
North Dakota	42.4	95	56	72	94
Minnesota	22.0	89	56	78	89
South Dakota	19.3	85	30	77	85
Washington	6.8	86	85	80	87
United States	100.0	90.8	56.7	76.5	90.4

CORN.

States.	Per cent. of U. S. acreage in State.	Condition September 1.			Aug. 1,
		1912.	1911.	10-yr. av.	1912.
Illinois	9.9	85	78	85	79
Iowa	9.3	93	68	81	89
Kansas	7.9	74	53	72	73
Missouri	7.1	84	69	82	81
Nebraska	7.0	80	63	81	79
Texas	6.8	75	39	70	75
Oklahoma	5.0	64	27	71	65
Indiana	4.6	85	80	86	80
Ohio	3.8	85	83	83	81
Georgia	3.7	75	88	86	75
Kentucky	3.3	87	73	85	83
Tennessee	3.1	82	92	85	81
Alabama	2.9	82	90	85	81
Mississippi	2.9	81	86	83	79
North Carolina	2.6	75	79	86	86
Arkansas	2.4	80	83	83	80
South Dakota	2.3	87	74	83	83
Minnesota	2.1	82	82	83	83
Virginia	1.8	74	72	86	85
South Carolina	1.8	77	78	83	79
Louisiana	1.7	81	76	82	81
Wisconsin	1.5	80	88	83	81
Michigan	1.5	75	81	80	73
Pennsylvania	1.3	80	89	84	80
United States	100.0	82.1	70.3	81.1	80.0

OATS.

States.	Per cent. of U. S. acreage in State.	Condition at time of harvest.			Aug. 1,
		1912.	1911.	10-yr. av.	1912.
Iowa	13.1	101	66	78	96
Illinois	11.2	98	71	77	94
Minnesota	7.8	96	61	81	92
North Dakota	6.1	97	66	77	94
Nebraska	6.0	76	31	73	78
Wisconsin	6.0	91	77	84	88
Ohio	5.6	98	77	82	96
Indiana	5.2	98	76	78	97
Kansas	4.5	84	35	65	86
South Dakota	4.1	87	24	81	87
Michigan	3.9	87	75	82	87
New York	3.1	78	80	90	77
Pennsylvania	2.9	87	79	87	87
Missouri	2.7	93	39	73	92
United States	100.0	92.3	64.5	78.8	90.3

A Shipper's Petition.

The Railway Business Association is sending out an appeal to shippers to sign a post card, the substance of which is an appeal to give to the railways a fair chance to earn a return on the money invested sufficient to interest new capital in railways; and to provide that in all adjustments of rates, adequate revenue for the railways shall be fully considered. This petition when completed is to be used to show political representatives of the people that shippers and receivers of freight appreciate the gravity of the question here involved. The association has already received signatures to the petition from, roughly, about 2,000 shippers.

The New York Central's Farming.

It is the belief of the shrewdest railway traffic makers that farm trains at their best do not stop long enough in any one town to be of permanent service, and so the New York Central has had built for this propaganda a specially designed car for farm exhibit and conference work. This car is now being slowly sent over its lines, the schedule being so planned that it spends at least a half a day in every little town. The road's own farm experts, carried on its salary rolls, accompany the car, and the amount of good this homely vehicle, traveling over the single track branches, has accomplished, cannot be estimated.

Recently the same road has given itself to a further extension of this work. In co-operation with the state and federal departments of agriculture and the supervisors of several counties, it has established local farm bureaus. Three of these are

already at work bettering New York state agriculture—in Oneida, in Oswego and in Jefferson counties. Each is in charge of a skilled and practical young man, graduate of Cornell Agricultural college, who makes it his business, not only to answer the queries of perplexed farmers by a personal visit to them for the earnest solution of their problems, but who also seeks out, on his own initiative, other farms which he hears are bringing real results. There is a common sense about such a plan that cannot fail to recommend it to any man who has at heart the renaissance of American agriculture.

The Erie, the Lehigh Valley and the Buffalo, Rochester & Pittsburgh have not lagged behind in doing their parts in the renaissance of New York agriculture. The New York Central and the Buffalo, Rochester & Pittsburgh have also established model farms, placing in each no more capital than would be at the disposal of an average farmer.

H. B. Fullerton, on the Long Island road, has had great success. From acres, run absolutely to waste, they have been made to bring forth an abundant variety of the vegetables that the New York City market demands. They have done more. Mr. Fullerton has pointed a way that every farmer within convenient reach of a large city might easily follow—by filling an ordinary sized market-basket with fresh vegetables and sending them into town, express paid, for a dollar. The chief trouble with the Long Island Railroad's farms, once this plan was devised, is that they have not been able to keep pace with the demands for the individual baskets.—*Edward Hungerford, in "Business America."*

British Tonnage for the Panama Canal.

The Paris correspondent of the *Boston News Bureau,* in discussing the Panama Canal bill, says in part: Of course, the preponderance of British tonnage in the American trade, greater perhaps than in any other part of the world, renders the bill and all that concerns it of far more vital import to British shipping interests than to those of any other European country. From the west coast of North America millions of bushels of wheat are carried annually by British vessels to England and the continent, the principal port of shipping being Portland, Ore. The route at present followed is by Cape Horn, and it can easily be seen how the voyage would be shortened via the Panama canal.

On the west coast of South America are situated the ports, from Talcahuano to Pisagua, whence the old world derives all its nitrate for agricultural purposes. Nine-tenths of this nitrate is carried in British bottoms, which would eventually use the Panama route. A number of steamship lines, as well as tramp steamers and sailing ships run from these ports, and would be badly hit by any restriction on their enterprise. There is also a vast trade done by British steamers in the carrying of case-oil from New York to China, Japan and the Far East generally. The Panama canal would open a new and shorter route to these steamers, enabling them to effect an appreciable saving of time in the performance of their voyages.

In addition, an enormous quantity of American coal is shipped from the northern United States to ports on the west coast, as well as a certain quantity of Welsh coal. This at present must perforce use the Cape Horn route, but will later go via the Panama canal. This trade almost exclusively employs British tonnage.

Mention must also be made of the almost certain development of coal fields on the west coast of South America, the product of which is said to equal in quality that of the best Welsh coal. Hitherto the length of the voyage and the lack of facilities have prevented capitalists from turning their attention to these coal fields. The opening of the canal, however, will, it is said, enable this coal, when once it is produced on a large scale, seriously to compete with Welsh coal. Here then is a further market for the British ship owner.

INTERSTATE COMMERCE COMMISSION.

Chairman Prouty of the Interstate Commerce Commission held a two-day hearing at St. Paul on September 12 and 13 in the investigation of alleged irregularities in the weighing of carload freight. C. F. Staples of the Minnesota railway commission testified that between April 16 and August 15, 1912, the railways had collected for the transportation of 2,884,330 lbs. of freight in Minnesota, which represented discrepancies in the car weights.

Special Examiner Elder held a hearing at Chicago on September 13 on a complaint filed by motorcycle manufacturers, charging undue discrimination in the classification of motorcycles at 2½ times the first class rate, while bicycles are rated at 1½ times the first class rate. Some testimony was also received on a complaint against the advance in coal rates over the Chicago, Burlington & Quincy from Springfield, Ill., to Clinton, Ia., which has been suspended.

STATE COMMISSIONS.

The Chamber of Commerce of South Bend, Ind., has filed a petition with the Indiana Railway Commission, asking that an order be issued, requiring the railways entering that city to do switching to and from the team tracks of competing lines.

The Indiana commission has notified the interurban railways of the state that the time has expired within which those roads ought to have installed the block system, in accordance with circulars (79 and 80) issued by the commission; and all of the companies are called upon to advise the commission in detail, within 30 days, the situation on their respective roads. After considering the information thus furnished, the commission will make a final order with reference to each company.

The New Orleans & Northeastern and the Alabama & Vicksburg have procured from the federal court an order restraining the Mississippi commission from enforcing its order of August 20, reducing the rates for the transportation of sand and gravel. The railways declare that the rates named by the commission are confiscatory. The carriers are willing to bear even more than their just share of the burden of building good roads in Mississippi, but the commission, it is claimed, has gone too far in its effort to favor the road-building enterprise.

Jungfrau Railway, Switzerland.—An extension of the Jungfrau Railway from the station Eismeer to Jungfraujoch, a distance of a little more than two miles, wholly in tunnel, were opened for traffic August 1. Six-sevenths of it has a grade of 333 ft. per mile, but the grade on the last 1,600 ft. is 1 in 4, and is worked by a cog-wheel engine. The new station is 11,343 ft. above sea level, and 12½ miles from the lower terminus of the railway. It takes 18 minutes to ascend the two miles. The fare for the entire round trip is $6.20.

Trans-Persian Railway.—Russian journals report that a commission of representatives of Russia, France and England has charge of the proposed railway entirely across Persia, connecting Turkish with Indian lines. The report says that 12 Russian railway companies and several financial houses of the three countries have declared themselves ready to supply the necessary capital, without guarantee from either the Russian or the Indian government. The commission estimates that the length of the line will be 1,400 miles, approximately, and that it will cost about $95,000,000. Its estimates of earnings and expenses must be chiefly guesswork, but even then the net earnings estimated are 3.78 per cent. on the capital, which seems not a very attractive prospect for capital.

Electrification in Switzerland.—A commission which has long been engaged in studying the adaptability of electricity as motive power of the Swiss railway system, and especially for the Gotthard Railway, has made a special report to the parliament of the confederacy in which it says that the available water power of the country is more than sufficient to move all the traffic, with such increases as may be expected for a long time to come; that the experience of recent years shows that the single-phase system offers the greatest advantages; that it will cost about $13,000,000 to equip the Gotthard Railway for electric traction, and that the yearly cost of such traction will be about $1,950,000, and nearly one-fifth less than the present cost. The single-phase system with 15 periods and 15,000 v. tension would be most suitable for this railway. The absence of smoke and the increase in the capacity of the line are advantages in addition to lessened cost.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

G. A. Abramson has been appointed auditor of freight accounts of the Oregon-Washington Railroad & Navigation Co.

Fred W. Sparling has been appointed assistant auditor of disbursements of the Michigan Central, with office at Detroit, Mich., succeeding Robert R. Richards, promoted.

T. B. Dixcy, formerly auditor of the Chicago, Rock Island & Pacific at Topeka, Kan., and recently a consulting auditor in New York City, has been appointed general auditor of the St. Louis & San Francisco, with office at St. Louis, Mo., succeeding to part of the duties of A. Douglas, vice-president and general auditor.

The following officers of the Sunset-Central lines of the Southern Pacific have had their jurisdiction extended over the Burr's Ferry, Browndel & Chester, a short road in Texas which was recently taken over by the Southern Pacific: W. B. Scott, president; W. G. Van Vleck, vice-president and general manager; G. R. Cottingham, secretary and auditor, and C. B. Udell, treasurer. A. A. Brooks, who has been auditor and purchasing agent of the Burr's Ferry, Browndel & Chester, has been assigned to duties in the disbursement department of the Sunset-Central lines.

William A. Garrett resigned on Wednesday as chairman of the General Managers Association, of Chicago, and the Association of Western Railways, with headquarters at Chicago, and was elected vice-president in charge of operation of the Chicago Great Western, a new office created to relieve President S. M. Felton, recently appointed receiver of the Pere Marquette, of a portion of his responsibilities. The appointment is effective at once. Mr. Garrett has held the chairmanship of the two associations in Chicago since October 1, 1911, when that office was made a permanent salaried position, instead of being held by one of the general managers, and in devoting his entire time to the work, he has been active in promoting the interests of the roads, and bringing about several reforms, which could only be accomplished in such a highly competitive center as Chicago, by the united action of all the roads. The General Managers' Association comprises 32 roads with a mileage of 82,950, and the Association of Western Railways, comprises all lines west of the Illinois Central, 66 roads, with a mileage of 131,440. Before coming to Chicago Mr. Garrett was for two years vice-president of the T. H. Symington Company, and for the two years before was president of the Seaboard Air Line. He was born on August 18, 1861 at Canton, Miss., and began railway work in 1876, as messenger in a ticket office of the Ohio & Mississippi, now a part of the Baltimore & Ohio Southwestern. Then he worked his way up in different departments in the St. Louis Union Depot until he was made assistant superintendent. From March, 1893, to January 1, 1896, he was superintendent of the Terminal Railroad Association of St. Louis, and from December, 1893, to January 1, 1896, also terminal superintendent of the Wabash; for the last two years of this period he was also superintendent of the St. Louis Merchants' Bridge Terminal. He was then appointed superintendent of the Western division of the Wabash, and in April, 1897, was transferred to the Middle division. In August, 1899, he was appointed superintendent of the Philadelphia division of the Philadelphia & Reading, and in September, 1900, was made superintendent of the New York division. He was promoted in March, 1902, to general superintendent. From 1903 to 1906, he was general manager of the Cincinnati, New Orleans & Texas Pacific, and the Alabama Great Southern, and then went to the Seaboard Air Line as vice-president, becoming president of that road in April, 1907.

W. A. Garrett.

Operating Officers.

T. L. Billingsley has been appointed general superintendent of the Portland, Eugene & Eastern, with office at Salem, Ore.

X. H. Cornell, superintendent of transportation of the Chicago & Alton, with office at Chicago, has resigned, and that office has been abolished.

Hiram J. Slifer, general manager of the Chicago Great Western, at Chicago, has resigned, and the office has been abolished. The duties of general manager have been assumed by W. A. Garrett, vice-president.

R. S. Marshall, assistant to vice-president and general manager of the Minneapolis & St. Louis, at Minneapolis, Minn., has been appointed superintendent, with office at Oskaloosa, Ia., succeeding H. G. Kruse, retired.

J. T. Cheek, trainmaster of the National Railways of Mexico at Gomez Palacio, Durango, Mex., has been appointed superintendent of the Gomez Palacio division, with office at Gomez Palacio, succeeding A. T. Chreitzberg, deceased.

J. E. Spurrier, superintendent of the Shenandoah division of the Baltimore & Ohio, with office at Winchester, Va., has been promoted to a position on the staff of General Manager C. W. Galloway, with headquarters at Baltimore, Md. G. D. Brooke, assistant superintendent of the Cumberland division at Keyser, W. Va., succeeds Mr. Spurrier.

E. H. Daniel, superintendent of the Macon and Chattanooga divisions of the Central of Georgia, at Macon, Ga., has been appointed transportation inspector. M. A. Ramsey, superintendent of the Columbus division, at Columbus, Ga., has been appointed superintendent of the Macon division, with headquarters at Macon. Henry Baldwin, transportation inspector at Savannah, Ga., succeeds Mr. Ramsey.

W. H. Riley, trainmaster of the Baltimore & Ohio, at Keyser, W. Va., has been appointed assistant superintendent of the Cumberland division, succeeding G. D. Brooke, promoted. Mr. Riley began railway work with the Baltimore & Ohio in March, 1887, as a brakeman at Wheeling, W. Va. He was appointed a conductor in 1889, and in August of the same year was made assistant trainmaster. He was promoted to trainmaster on June 1, 1907, at Wheeling, and in March, 1911, was appointed trainmaster of the same road, which position he held at the time of his appointment as above noted.

Traffic Officers.

M. C. Bailey has been appointed traveling freight agent of the Texas & Pacific, with headquarters at Dallas, Tex.

H. D. Bellamy, contracting freight agent of the Wabash at Des Moines, Iowa, has resigned to engage in other business.

J. A Munro has been appointed traveling freight agent of the Gulf, Colorado & Santa Fe, with headquarters at Temple, Tex.

Hamilton O'Connor has been appointed assistant general passenger agent of the Toledo, Peoria & Western, with office at Peoria, Ill.

Heber Page, general agent of the Missouri, Kansas & Texas of Texas, with headquarters at Dallas, Tex., has resigned to engage in other business.

D. E. Peterson has been appointed district passenger agent of the Chicago Great Western, with office at Des Moines, Iowa, succeeding Thomas Judd, resigned.

W. L. Geer, commercial agent of the St. Louis Southwestern

at Waco, Tex., has been appointed also commercial agent of the Stephenville, North & South Texas at Waco.

J. B. Day, city passenger and ticket agent of the Delaware, Lackawanna & Western, at Buffalo, N. Y., has been appointed traveling passenger agent, with headquarters at Buffalo.

A. D. Pinkerton has been appointed soliciting freight agent of the International & Great Northern, with headquarters at Galveston, Tex., succeeding J. P. Fresenius, resigned.

W. W. Blakely has been appointed general commercial agent of the Continental Line, and the Central States Dispatch, with headquarters at Louisville, Ky., succeeding J. M. Ryan, deceased.

Grant Williams has been appointed assistant general freight agent of the Chicago, Milwaukee & St. Paul, with office at Chicago, succeeding George A. Blair, resigned to accept service with another company.

J. P. Baker, soliciting freight agent of the Rock Island Lines at Houston, Texas, has been appointed commercial agent, with office at San Antonio, Tex., succeeding J. E. Bell. D. O'Leary succeeds Mr. Baker.

A. Catuna, general agent of the Kansas City Southern at Dallas, Tex., has been appointed general cotton agent of that road, and Henry Brown, traveling freight agent at Chicago, succeeds Mr. Catuna at Dallas.

W. B. Steele, soliciting agent of the Mallory Steamship Company at Dallas, Tex., has been appointed commercial agent of that company, with office at Waco, Tex., succeeding Reed Finley, resigned to accept service elsewhere.

Oliver T. Boyd, assistant general manager of the Hudson & Manhattan, at New York, has been appointed district passenger agent of the Pennsylvania Railroad, with headquarters at Pittsburgh, Pa., succeeding J. P. Anderson, promoted.

The title of the following general agents of the Hocking Valley will be changed on October 1, to commercial agent: H. E. Thatcher, Toledo, Ohio; H. M. Hall, Chicago; B. H. Aiken, Wellston, Ohio; W. O. Sydnor, Charleston, W. Va.

O. S. Lewis, who has been in the service of the Cincinnati, Hamilton & Dayton, in the freight offices at Cincinnati, Ohio, for 15 years, has been appointed division freight agent, with office at Dayton, Ohio, succeeding E. D. Poole, deceased.

J. H. McEwen, general agent of the American Refrigerator Transit Company at St. Louis, Mo., has been transferred to Detroit, Mich., succeeding G. R. Layher, resigned to accept service with another company, and O. H. Lutteke succeeds Mr. McEwen.

W. H. H. Terrell, commercial agent of the Seaboard Air Line at Chattanooga, Tenn., has been appointed commercial agent, with office at Cincinnati, Ohio, succeeding E. R. Vazeille, resigned. J. S. Lambert, commercial agent at Savannah, Ga., succeeds Mr. Terrell, and H. F. Owen succeeds M. Lambert.

Wendell J. Sack has been appointed traveling passenger agent of the Union Pacific, the Southern Pacific, the Oregon Short Line and the Oregon-Washington Railroad & Navigation Company, with office at Chicago, succeeding Edgar M. Mattes, who has been made passenger agent in place of Harry E. Moores, resigned.

E. P. Eyman, Jr., has been appointed traveling agent of the Chicago & North Western, with office at Chicago, succeeding J. J. Livingston, promoted; and William L. Colburn has been appointed traveling agent at Sioux City, Iowa, succeeding D. M. Davis, transferred. F. C. Bush has been appointed traveling agent at Birmingham, Ala., a new position. F. G. Reigart, traveling agent at Pittsburgh, Pa., has been appointed soliciting agent at New York City, and F. G. Fitzpatrick succeeds Mr. Reigart.

George Moffet has been appointed commercial agent of the Chesapeake & Ohio and the Chesapeake & Ohio of Indiana, with office at Louisville, Ky., succeeding S. J. McBride, resigned to accept service with Blue Ridge Despatch. R. A. P. Walker, northeastern agent of the Kanawha Despatch, at Boston, Mass., has been appointed general agent, freight department, with office at Cincinnati, Ohio, succeeding O. N. Seely, transferred to the Kanawha Despatch, with headquarters at Boston, Mass.

C. W. Galligan, general freight agent of the Chicago, Peoria & St. Louis, at St. Louis, Mo., has been appointed general freight agent of the Chicago & Alton, with office at Chicago, and J. A. Behrle has been appointed chief of the tariff bureau at Chicago. S. W. Myers has been made Southwestern freight agent, with headquarters at Dallas, Tex. William J. Dibble has been appointed commercial agent, with office at Cleveland, Ohio, and C. R. Murray has been made district passenger agent, with headquarters at Detroit, Mich., succeeding W. C. Mueller, traveling passenger agent at Detroit, transferred to St. Louis as city passenger and ticket agent. Bart Riedy, traveling freight agent at Milwaukee, Wis., has been appointed commercial agent, with office at Little Rock, Ark.

G. K. Caldwell, whose appointment as assistant general freight agent of the Southern Railway, with headquarters at Atlanta, Ga., has been announced in these columns, was born in Knoxville, Tenn. He began railway work in 1894, with the East Tennessee, Virginia & Georgia, and was then in the service of its successor, the Southern Railway, holding various positions in the freight traffic department until April, 1903, when he left that company to become chief rate clerk to the general freight agent of the Central of Georgia, at Savannah, Ga. On November 1, 1905, he returned to the service of the Southern Railway as chief clerk to the general freight agent at Atlanta. He was later chief clerk to the freight traffic manager, and then to the vice-president in charge of traffic, until his promotion to division freight agent, with headquarters at Columbia, S. C., which position he held at the time of his recent appointment as assistant general freight agent of the same road.

Randall Clifton, whose appointment as assistant freight traffic manager of the Southern Railway, with headquarters at Washington, D. C., has been announced in these columns, began railway work in 1890, at Columbus, Ga., as a clerk in the office of the general freight and passenger agent of the Georgia, Midland & Gulf, now a part of the Southern Railway. He then held several clerical positions in the traffic department of a number of railways now included in the Southern Railway until December, 1899, when he was appointed district passenger agent of the Southern at Savannah, Ga. From July, 1900, to September, 1904, he was chief clerk to the traffic manager and freight traffic manager of the same road at Washington, D. C., and was then made division freight agent at Raleigh, N. C. In December, 1904, he was promoted to assistant general freight agent at Memphis, Tenn., and in April, 1905, was transferred in the same capacity to Atlanta, Ga. He was again promoted on April 4, 1907, to general freight agent in charge of the Atlanta and Columbus traffic divisions and of Florida agencies. On September 15, 1908, he was made general freight agent, with headquarters at Atlanta, which position he held at the time of his recent appointment as assistant freight traffic manager of the same road, as above noted.

William Hamilton Paxton, who has been appointed general freight agent of the Southern Railway, with headquarters at Atlanta, Ga., as has been announced in these columns, was born on April 7, 1866, at Knoxville, Tenn., and was educated in the schools of his native town, and at the University of Tennessee. He began railway work in April, 1883, on the East Tennessee, Virginia & Georgia, now a part of the Southern Railway. In September, 1890, he was appointed chief clerk on the Chattanooga, Rome & Columbus, now a part of the Central of Georgia, and one year later was made chief clerk for the Southern Railway and Steamship Association. The following April he returned to the East Tennessee, Virginia & Georgia as chief rate clerk, and from September, 1892, to 1894, was chief rate clerk on the Richmond & Danville. He was then chief clerk to the assistant general freight agent of the Southern Railway, at Richmond, Va., until April, 1899, when he became chief rate clerk of the same road at Washington, and was later made chief clerk, first at Washington, and then at Atlanta. In 1904, he was appointed assistant to the general freight agent, and in 1905 was promoted to assistant general freight agent, which position he held at the time of his recent appointment as general freight agent of the same road, as above noted.

Engineering and Rolling Stock Officers.

T. V. Thaggard has been appointed terminals roadmaster of the Texas & Pacific, with office at New Orleans, La.

R. T, Shea, general inspector of shops, of the New York Central & Hudson River, at New York, resigned recently.

C. E. Langton has been appointed master mechanic of the Marshall & East Texas, succeeding F. A. Walsh, resigned to engage in other business.

L. P. Mase has been appointed supervisor of signals, electric division of the New York Central & Hudson River, with headquarters at New York, succeeding M. W. Bennett, transferred.

D. Burkhalter, superintendent of the wood preserving plant of the Buffalo, Rochester & Pittsburgh at Bradford, Pa., has resigned to go to the Eagle Harbor plant of the Pacific Creosoting Company, with office at Seattle, Wash.

Howell H. Althouse, principal assistant engineer of the Erie for the lines West, has been appointed chief engineer, with office at New York He was born on June 24, 1869, at Pottsville, Pa., and was educated in the high schools. In July, 1889, he began railway work as a rodman with the Lehigh Valley, and was later levelman. From 1890 to 1892 he was transitman on the same road. He was out of railway work from 1892 to 1894, engaged in work on sewerage disposal plants and other general work at Pottsville, Pa. In 1894 he went to the Philadelphia & Reading as transitman. From 1896 to 1897 he was again out of railway work. He was appointed transitman on construction work for the Central of New Jersey in 1897, and left that company in June, 1899, to go with the Erie, and has been in the service of that company ever since, first as transitman on surveys at Meadville, Pa., and later at Galion, Ohio. From October, 1899, to August, 1902, he was assistant engineer on surveys and construction work at Galion. In August, 1902, he was promoted to assistant engineer at New York. He remained in that position until July, 1912, when he was made principal assistant engineer for the lines West, with office at New York, and now becomes chief engineer of the same road, as above noted.

H. H. Althouse.

Alfred M. Darlow, mechanical engineer and general storekeeper of the Buffalo & Susquehanna at Galeton, Pa., has been appointed superintendent of motive power in charge of the mechanical and store departments, with office at Galeton.

R. O. Rote, principal assistant engineer of the Lake Shore & Michigan Southern at Cleveland, Ohio, has been appointed assistant chief engineer, with office at Cleveland, succeeding George C. Cleveland, promoted. H. B. Reinsagen succeeds Mr. Rote.

E. J. Brennan has been appointed master mechanic of the Du Bois shops of the Buffalo, Rochester & Pittsburgh, with headquarters at Du Bois, Pa. J. P. Kendrick has been appointed master mechanic of the Middle and Pittsburgh divisions, with headquarters at Punxsutawney, Pa.

J. Emerling, supervisor of subdivision No. 13, Salamanca branch, Allegheny division of the Pennsylvania Railroad at Salamanca, N. Y., has been appointed supervisor of sub-division No. 4, Allegheny division, with headquarters at South Oil City, Pa., succeeding R. B. Harris, transferred. H. A. John, Jr., supervisor of sub-division No. 14, Low Grade branch, Allegheny division, at New Bethlehem, Pa., succeeds Mr. Emerling. R. B. Harris, succeeds Mr. John.

G. I. Evans, whose appointment as superintendent of locomotive shops, of the Canadian Pacific, at Angus, Montreal, Que., has been announced in these columns, was born in May, 1880, at Montreal. He began railway work on April 1, 1900, with the Canadian Pacific as a draftsman, remaining in that position until March, 1906, when he was promoted to chief draftsman. In July, 1910, he was appointed mechanical engineer of the same road, which position he held at the time of his recent appointment as superintendent of shops, as above noted.

Stanley S. Wagar, whose appointment as chemist and engineer of tests of the Buffalo, Rochester & Pittsburgh, with office at Du Bois, Pa., has been announced in these columns, was born in December, 1886, at Troy, N. Y., and was educated at Rensselaer Polytechnic Institute. He began railway work in May, 1910, with the Union Pacific as material inspector, and from April to September, 1911, was assistant chemist on the Missouri Pacific. He was then with the St. Louis & San Francisco as chemist until August, 1912, and now becomes chemist and engineer of tests of the Buffalo, Rochester & Pittsburgh, as above noted.

Purchasing Officers.

W. L. Wene, purchasing agent of the Tennessee Central, at Nashville, Tenn., has resigned, and the position has been abolished. The duties of purchasing agent have been assumed by the president.

OBITUARY.

John W. Skeele, president of the Lehigh Valley Coal Sales Company, died on September 17, at his home at Madison, N. J. He was born in 1853, and began railway work as a telegraph operator on the Delaware, Lackawanna & Western. He was station agent at Dover, N. J., and later train despatcher at Syracuse, N. Y. In 1892, he was made agent of the Philadelphia & Reading Coal & Iron Company, at Chicago, and afterwards represented the Lehigh Valley Coal Company at Chicago. In 1899, he was appointed general sales agent of the Lehigh Valley Coal Company, and three years ago was made vice-president and general sales manager of that company. On March 1, 1912, he was elected president of the new Lehigh Valley Coal Sales Company.

William E. Fraser, division freight agent of the Pennsylvania Railroad, with headquarters at Williamsport, Pa., died on September 12, at Philadelphia. He was born at Lewiston, N. Y., on September 17, 1854, and graduated from the common schools. At the age of 14 he entered the service of the Lake Shore & Michigan Southern as a ticket clerk at Buffalo, N. Y., remaining with that company until April, 1876. He went to the Northern Central in May, 1876, since which time he has been consecutively traveling passenger agent, traveling freight agent, agent for New York state and Canada, and district passenger agent, at Buffalo. On June 1, 1890, he was promoted to division freight agent of the Pennsylvania Railroad and the Northern Central, with office at Williamsport, Pa., having charge over the Williamsport and the Sunbury divisions of the Pennsylvania Railroad, and the Susquehanna, the Shamokin and the Elmira divisions of the Northern Central.

PROPOSED CHANGES IN RUSSIA.—The Russian government will undertake an investigation to ascertain whether it would not be practicable to increase the capacity of the standard freight cars in Russia to 36,125 lbs., to require substantial conformity to that standard, and to require an extended interchange of the whole freight car stock by all the Russian railways. It is also recommended that four chief types of locomotives be standardized, and that those not immediately required be put into a reserve park, from which engines may be sent whenever needed.

STEAMSHIP LINE TO CHINA PROPOSED.—It is reported that the Chinese government has decided to encourage the project of the Los Angeles Chamber of Commerce and other Chinese organizations for the establishment of a big steamship line between Chinese and Californian ports. Dr. Sun Yat-sen is said to have endorsed the movement and to be urging the Chinese government to help finance this trans-Pacific project for the maritime awakening of China. Two capitalists of Shanghai are said to be in New York to seek financial aid for the project.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Denver & Rio Grande is figuring on 6 passenger locomotives.

The Canadian Pacific has ordered 125 locomotives from the Montreal Locomotive Works.

John Maisch has ordered four six-wheel switching locomotives from the Baldwin Locomotive Works.

The Oliver Chilled Plow Works has ordered one switching locomotive from the Baldwin Locomotive Works.

The Maxton, Alma & Southbound has ordered one ten-wheel locomotive from the Baldwin Locomotive Works.

The Lake Shore & Michigan Southern has ordered 20 mikado locomotives from the American Locomotive Company.

The Chicago, Burlington & Quincy has ordered ten six-wheel switching locomotives from the Baldwin Locomotive Works.

The Standard Oil Company, New York, has ordered one four-wheel switching locomotive from the Baldwin Locomotive Works.

The Pennsylvania Railroad is building 26 freight locomotives, 25 switching locomotives, and 8 passenger locomotives at its Altoona shops.

The Louisiana Railway & Navigation Company has ordered two consolidation locomotives from the Baldwin Locomotive Works.

The Grand Trunk has ordered 25 mikado locomotives from the American Locomotive Company. The dimensions of the cylinders will be 27 in. x 30 in., the diameter of the driving wheels will be 53 in., the total weight in working order will be 276,000 lbs. These locomotives will be equipped with superheaters.

The United States War Department has ordered one four-wheel switching locomotive from the American Locomotive Company. The cylinders will be 11 in. x 16 in., the diameter of the driving wheels will be 33 in., and the total weight in working order will be 39,000 lbs. This locomotive is for use in Porto Rico.

CAR BUILDING.

The Canadian Pacific is figuring on 60 sleeping cars.

The Central of New Jersey is in the market for 1,000 hopper cars.

The San Pedro, Los Angeles & Salt Lake is figuring on 350 box cars.

The Chicago, Burlington & Quincy is figuring on 500 steel underframe flat cars.

The Cambria & Indiana has ordered 400 freight cars from the Cambria Steel Company.

The Wabash has ordered 500 hopper car bodies from the Western Steel Car & Foundry Company.

The Union Tank Line, New York, has ordered 1,000 tank cars from the Pressed Steel Car Company.

The Northern Pacific has ordered 2,500 steel underframes from the Western Steel Car & Foundry Company.

The Merchants' Despatch Transportation, New York, is building 60 express cars at the company's shops.

The Baltimore & Ohio has ordered 2,000 box cars from the Cambria Steel Company, and is in the market for 500 steel underframes.

IRON AND STEEL.

The Chicago, Milwaukee & St. Paul has ordered 10,000 tons of rails from the Illinois Steel Company.

Supply Trade News.

The name of the Hall Railway Signal Company, New York, successor to the Hall Signal Company, has been changed to the Hall Switch & Signal Company.

Frank G. Wright, formerly works manager at the Indiana Harbor plant of the American Steel Foundries, has been appointed general manager of the Ohio Steel Foundry Company, Lima, Ohio.

Western Electric Company, New York, will spend about $750,000 on enlarging its plant at Hawthorne, Ill., to take over the company's New York manufacturing business. The additions will be completed in about a year.

Joseph T. Markham, for several years general sales agent of the Sellers Manufacturing Company, Chicago, has resigned, and on October 1 will become vice-president of the St. Louis Car Wheel Company, with headquarters in St. Louis.

The Roberts & Schaefer Company, Chicago, has received an order from the Queen & Crescent for a 500-ton, reinforced, concrete, Holmen, counterbalanced, bucket, locomotive, coaling station for installation at Ludlow, Ky. The contract price is $17,500. This company has also received an order from the Louisville & Nashville for a 400-ton frame constructed, counterbalanced, bucket coaling station, for installation at Livingston, Ky.

The Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., has declared a dividend of 1 per cent. on the common stock, for the quarter ended September 30. Six months ago 1 per cent. was declared on the common stock. The common dividend is payable October 30 to stock of record September 30. The following statement was authorized by the chairman of the board of directors: The action of the directors means that the common is established on a 4 per cent. basis and will continue on a 4 per cent. basis unless there develop less favorable conditions than the present outlook indicates. Increases in the dividend will be subject to future consideration.

TRADE PUBLICATIONS.

Brill Car Parts.—The J. G. Brill Company, Philadelphia, Pa., has published in catalog No. 201, an order guide for car parts and specialties, in which every part is listed, illustrated and given an order number.

Reverse Valve.—J. W. Kerlin, Roanoke, Va., has published a brief folder on the Conner-Kerlin Crossport reverse valve. This folder is illustrated by means of diagrams and points out the advantages of these valves.

Machine Tools.—The Newton Machine Tool Works, Philadelphia, Pa., has published catalog No. 47 of its machine tools. This catalog is very full, well illustrated and gives the capacities and dimensions of the various types of machine tools.

Oxy-Acetylene Welding.—The Davis-Bournonville Company, New York, has devoted folder No. 6 to the Oxy-Acetylene process in locomotive repair work. A number of illustrations are included showing different parts of locomotives that have been repaired by this process, and a brief account is given of how long the work took and what the approximate cost was.

Rock Drills.—The Chicago Pneumatic Tool Company, Chicago, has devoted bulletin No. 118 to the Chicago Giant rock drills of the auxiliary valve type. This bulletin is illustrated by means of diagrams, and includes detailed descriptions of the operation of these drills. Bulletin No. 120, published by this company, gives instructions for fitting up and operating these drills.

Welded Pipe.—The National Tube Company, Pittsburgh, Pa., has published an interesting booklet on the manufacture and characteristics of modern welded pipe. Two interesting tables are included, one giving the result of bursting tests made by the National Tube Company of commercial tubes and pipes; the other giving a summary of results of investigations of the corrosion of iron and steel in actual service.

Railway Construction.

New Incorporations, Surveys, Etc.

ATLANTIC, POCAHONTAS & NORTHWESTERN.—An officer writes that the right of way is being secured and grading work is under way on a line from Elkhorn City, Kan., southeast through the Buchanan county coal fields to Raven, Va., 50 miles. The company expects that the line will be completed and in operation by February, 1913. G. H. Whitehead, Elkhorn City, is president.

BERKSHIRE STREET RAILWAY (Electric).—An officer writes that a contract has been given to the Western Massachusetts Contracting Company, Westfield, Mass., to build from Lee, Mass., east via Becket, thence south to Otis and east via Blandford to Huntington, about 35 miles. Some of the track has been laid. L. S. Storrs is vice-president, New Haven, Conn., and A. H. Towne, is engineer, Great Barrington, Mass.

CENTRAL & WESTERN ILLINOIS TRACTION.—An officer writes that this company was organized in August to build from Pekin, Ill., north via Peoria, thence west to Keokuk, Iowa, about 100 miles. The prospects of building the line are good. The company expects to develop a traffic in passengers, coal, corn, live stock and manufactured products. A. L. Ralston, 44 North Main street, Canton, Ill., is general manager.

CHARLESTON, PARKERSBURG & WESTERN.—An officer writes that this company was organized to build from Charleston, W. Va., north via Sissonville, Walton, Spencer, Palestine and Elizabeth to Parkersburg, 82 miles. Trackage rights may be obtained for 30 miles over the Little Kanawha Railway from Elizabeth to Parkersburg. The maximum grades will be 1 per cent., and maximum curvature 8 deg. There will be a few steel bridges. Some of the track has been laid. The company expects soon to have financial arrangements completed to continue the track laying. Edward M. Craig, Charleston, is president.

CROSBYTON-SOUTH PLAINS.—This road now in operation between Lubbeck and Crosbyton, 38 miles, is to be extended from Crosbyton to Seymour, about 120 miles (May 10, p. 1078.)

CULPEPER, MADISON & RAPPAHANNOCK.—Incorporated in Virginia with $1,000,000 capital, to build from Culpeper, Va., northwest to Washington, about 32 miles. P. H. O'Bannon, president, Sperryville; E. J. Foote, secretary and treasurer, Culpeper.

DENVER & RIO GRANDE.—An officer is quoted as saying that the company has decided to change the present narrow gage line over Marshall Pass, between Salida, Colo., and Montrose, about 136 miles, to standard gage. It is expected that the work will be finished within 12 months.

EL PASO & SOUTHWESTERN.—An officer writes that track has been laid from Fairbanks, Ariz., for a distance of 40 miles to Cienega creek, on the extension building from Fairbanks to Tucson, 66 miles. Track laying on the remaining 26 miles to Tucson will be delayed until about October 1, when it is expected that the bridge over Cienega creek will be finished. All the work will probably be finished by November 1. (May 24, page 1180.)

GREEN BRIER, CHEAT & ELK.—Bids are wanted September 20 for building 10 miles of railway to connect with the Western Maryland near Bemis, W. Va. The work involves handling about 300,000 cu. yds. E. P. Shaffer, manager, Cass, W. Va.

GULF, TEXAS & WESTERN.—Grading work is about half finished on the extension from Jacksboro, Tex., south to Salesville, 23 miles. The Texas Building Company, Fort Worth, has the contract. (July 12, p. 80.)

HOUSTON & TEXAS CENTRAL.—Contracts have been let to complete the cut-off from Stone City, Tex., southwest, to Giddings, about 40 miles. The grading work is about half finished. (March 1, p. 408.)

JEFFERSON COUNTY TRACTION.—The plans call for building from Beaumont, Tex., south to Port Arthur, 21 miles. It is expected that the work will be carried out by the Stone & Webster Engineering Corporation. Mark Lowd will probably be the chief engineer. E. B. Parker, Houston, Tex., is interested.

KENTUCKY SOUTHWESTERN ELECTRIC RAILWAY, LIGHT & POWER CO.—An officer writes that the prospects of building a railway from Paducah, Ky., south to Mayfield, thence to Murray, about 45 miles, are good, and that contracts will probably be let during 1912 for the work. The plans call for building from Henderson, Ky., southwest via Paducah, Mayfield and Murray to Hickman, in all about 210 miles. There will be two large bridges and several smaller bridges. W. A. Calhoun, consulting engineer, Paducah.

LA SALLE COUNTY (Electric).—An officer writes that work is nearing completion on a line from Mendota, Ill., southeast via Prairie Center and Wallace Center to Ottawa, about 20 miles. The company will use both steam and electricity for the motive power, and expects to develop a traffic in corn, grain, fire clay, coal and general merchandise. G. H. Dodge, 1511 Dearborn street, Chicago, is president.

LEHIGH VALLEY.—A contract has been given to the Miles Tighe Construction Company, Easton, Pa., for laying five miles of third-track and five miles of fourth-track between South Somerville, N. J., and Flagtown, and to the J. A. Kelley Company, Philadelphia, Pa., for five miles of third-track from Three Bridges, N. J., to Stanton, also for 10 miles of third-track from P. & L. Junction to Stafford, N. Y.

LOUISIANA & ARKANSAS.—An officer writes that the general contract has been given to M. Tansey, Jena, La., and a subcontract has been given to the List & Gifford Construction Company, Kansas City, Mo., to build from Jena, La., to Jonesville, about 20 miles. About 12 miles of track has been laid. The work involves handling about 800,000 cu. yds. of earth. There will be one 354-ft. steel bridge over Little river, and another 825-ft. steel bridge over Black river. There will also be a trestle 3,000 ft. long and another 2,000 ft. long. The company expects to develop a traffic in lumber, forest products, agricultural products and general merchandise. William Buchanan, Texarkana, Ark., is president.

NEW YORK SUBWAYS.—Contracts have been let by the New York State Public Service Commission, Second district, as follows: F. L. Cranford, section No. 1 of the Broadway-Lexington avenue route, $1,202,269; F. L. Cranford, section No. 1 A of the Broadway-Lexington avenue, $982,740; Degnon Contracting Company, section No. 1 extension of the Fourth avenue subway, $1,930,638; the same company, section No. 2 of the Fourth avenue subway, $1,904,171; John F. Stevens Construction Company, section No. 1 of the Southern Boulevard route, $2,253,281.

QUANAH, ACME & PACIFIC.—An officer writes that a contract has been given to the Texas Building Company, Fort Worth, Tex., to build a 40-mile extension from Paducah, Cottle county, Tex., west to Roaring Springs, Motley county. The maximum grades will be 1 per cent. compensated, and maximum curvature 4 deg. Some of the work will be heavy. There will be trestles over Tongue river and over Dutchman creek. (September 6, p. 453.)

RIVEIRA BEACH INTERURBAN.—Grading work has been finished and track laying is to be started at once from Riveira, Nueces county, Texas., to the Gulf of Mexico, 15 miles. It is expected that the line will be opened for operation this year.

SAN ANTONIO, UVALDE & GULF.—Grading on this line has been finished between San Antonio, Tex., and Fowlerton, and about 45 miles of track has been laid. Steel work for the bridge over the Medina River and other bridge and trestle material is at hand. (April 26, p. 893.)

SOUTHERN ILLINOIS RAILWAY & POWER COMPANY.—An officer writes that plans have been made to build a railway from Eldorado, Ill., to Carrier Mills, about 15 miles. The W. H. Schott Company, Chicago, has the general contract. (July 26, p. 185.)

SOUTHERN TRACTION COMPANY.—An officer writes that the company was organized to build from Dallas, Tex., south via Ferris, Waxahachie, and Hillsboro to Waco, 101 miles, with a branch from Ferris, south to Corsicana, 34 miles. Grading is 60 per cent. finished, but no track has yet been laid. Contracts have been let for grading to the Kamer Brothers Company, Dallas, and to Austin Brothers, Dallas, for the bridge work. The maximum grades will be 2 per cent., and the maximum curvature 20 deg. There will be 20 steel bridges and 3½ miles of

trestles. The company has not made any plans for building to Houston, or to Galveston. J. F. Strickland, Dallas, is president.

Texas Roads.—Plans are being made to build a line from Houston, Tex., south via Liverpool and Manvel to Velasco, about 100 miles. Dr. F. S. George, Dayton, Ohio, may be addressed.

RAILWAY STRUCTURES.

Allegheny, Pa.—Extensive passenger and freight terminals will be put up by the Baltimore & Ohio at Allegheny. Plans are now being made for the improvements to include a modern passenger station and office building, and a large freight house. The work will cost about $250,000. The passenger station is to be 100 ft. long x 38 ft. wide, of brick construction. The freight house will be two stories high, 352 ft. long x 100 ft. wide. Besides the passenger and freight buildings, there will be a viaduct 30 ft. wide running alongside of the freight building at the second story level, leading from Anderson street to Sandusky street, for a distance of about 450 ft.

Buffalo, N. Y.—The New York Public Service Commission, Second district, has authorized the Buffalo Freight Terminal & Warehouse Company to build a terminal and warehouse, at Ganson street and Hatch slip, in Buffalo.

Decatur, Ill.—The Wabash has awarded a contract to the Decatur Bridge Company for the structural work on its new locomotive repair shops.

Henderson, Ky.—See Kentucky Southwestern Electric Railway, Light & Power Company, under Railway Construction.

Kline, S. C.—The Southern Railway is receiving bids, for putting up a combined freight and pasenger station, at Kline. The new building will be of frame construction with metal roof, 22 ft. x 54 ft.

Memphis, Tenn.—An ordinance was passed by the city council of Memphis, Tenn., on September 17, calling for the elevation of the Illinois Central tracks in the vicinity of Calhoun street station. Work is to be started at once on the elevation of the tracks and on the construction of a new depot to be erected on the site of the present Calhoun street station. The station will accommodate the Rock Island and the Frisco, in addition to the Yazoo & Mississippi Valley and the Illinois Central, and will include a six-story office building. The estimated cost of the entire project, exclusive of land, is $1,500,000.

New York.—Samuel Rea, president of the New York Connecting Railroad, announces that the contract for the foundation and masonry for the piers of the Bronx Kill and Little Hell Gate bridges, Randall's Island, Ward's Island and Long Island viaducts, has been awarded to Patrick Ryan, New York.

Norfolk, Va.—According to press reports, bids are wanted September 25, by the Atlantic Coast Line for putting up an additional freight pier, to be 800 ft. long, and to make other terminal improvements. The cost of the work will be about $300,000.

Bids are wanted September 30, by the Norfolk & Washington Steamboat Company for constructing a new terminal at Norfolk.

North Platte, Neb.—The Union Pacific is planning the construction of a new 28-stall roundhouse during the present fiscal year, including a coaling station, cinder pit, water tank, etc.

Philadelphia, Pa.—The Pennsylvania Railroad has given a contract to James Stewart & Company, Chicago, for putting up a reinforced concrete grain elevator at Girard Point, Philadelphia, to cost about $700,000. In connection with this improvement a contract has been given to the Armstrong & Latta Company, Philadelphia, for putting up a new concrete pier, 500 feet long, to cost about $100,000.

Pocatello, Idaho.—The Oregon Short Line has asked for bids on a new steel and concrete freight house.

Tucson, Ariz.—The Southern Pacific has begun work on the enlargement of its shops at this point. The main building will be 100 ft. x 200 ft., and will be equipped for handling repairs to the largest locomotives. The plans also provide for a 350,000-gal. tank.

Railway Financial News.

Baltimore & Ohio.—The following proprietary lines of the Baltimore & Ohio are to be merged with the parent company: Pittsburgh & Connellsville, 148 miles; Berlin Railroad, eight miles; Fayette County Railroad, 11 miles; Somerset & Cambria Railroad, 49 miles; Glenwood Railroad, 1½ miles; Salisbury Railroad, 16 miles; Mount Pleasant & Broad Ford Railroad, 10 miles; Ohio & Baltimore Short Line, seven miles.

Connecticut River Railroad.—Stockholders have voted to accept the act of the Massachusetts legislature authorizing the company to buy the property and franchises of the Vermont Valley Railroad and of the Sullivan County Railroad.

Denver & Rio Grande.—See this company under Railway Construction in regard to the proposal to spend $2,000,000 to change to standard gage its line between Salida, Col., and Montrose.

Denver, Northwestern & Pacific.—Newman Erb has confirmed the report that Dr. F. S. Pearson, F. H. Prince & Co., of Boston, and Fisher, Dunn & Co., of London, are associated with him in the reorganization of the Denver, Northwestern & Pacific.

Great Northern.—The suit brought in 1907 by C. H. Venner to compel the return of the Great Northern Iron Ore properties to the Great Northern Railway has been settled out of court.

Hocking Valley.—A quarterly dividend of 1¾ per cent. has been declared on the $11,000,000 stock, the majority of which is owned by the Chesapeake & Ohio. A 4 per cent. semi-annual dividend was paid in June and a 3 per cent. dividend was paid in December, 1911; so that there was 7 per cent. paid in the fiscal year ended June 30, 1912, and the present annual rate is the same, 7 per cent.

Missouri & Illinois Bridge & Belt.—W. C. Loree, general manager of the Baltimore & Ohio, has been elected a director of the M. & I. B. & B., succeeding C. W. Galloway. J. Q. Van Winkle, general manager of the Cleveland, Cincinnati, Chicago & St. Louis, has been elected a director, succeeding C. E. Schaff, who in turn has been elected a director, succeeding A. A. Allen, retired.

Old Colony.—Stockholders are asked to approve on September 24 the vote of the directors to sell at auction $800,000 additional stock to pay the Old Colony's share of four-tracking and electrification of the Boston & Providence.

St. Joseph & Grand Island.—Stockholders will meet on October 3 at Elwood, Kan., to vote on a proposed bond issue of $15,000,000. A mortgage will be placed on the main line of the road from St. Joseph, Mo., to Grand Island, Neb., and its branch line from Souts to Highland.

St. Louis Southwestern.—This company, which is now paying dividends semi-annually on its $19,893,650 preferred stock at the rate of 5 per cent. annually, has changed to a 1¼ per cent. dividend quarterly, making no change in the annual rate.

Southern Railway.—A semi-annual dividend of 2½ per cent. has been declared on the $60,000,000 5 per cent. non-cumulative preferred stock, thus placing the preferred stock on a 5 per cent. annual basis. The company resumed dividends in 1911, after suspension of two years, by the payment of 1 per cent. semi-annually. In the first half of 1912 a semi-annual dividend of 2 per cent. was declared.

Sullivan County Railroad.—See Connecticut River Railroad.

Vermont Valley Railroad.—See Connecticut River Railroad.

New Line for Russia.—The Russian authorities have declared in favor of constructing the long talked of line from Moscow westward to the Baltic seaport Reval, a naval port free from ice in winter.

Four-Tracking Work in New South Wales.—The four-tracking work on the line from Illawara, New South Wales, to Bankstown is progressing rapidly. It is expected that it will be completed before the end of the year.